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THE FUTURE OF OPERATIVE DENTISTRY—A FORECAST

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NO GREATER difficulty presents itself to the human mind in this age than a forecast of the progress that may be made in a given field, when flights of fancy or miraculous dreams are in themselves transcended by the accomplishments of the day. One approaches the discussion of such a subject with some trepidation lest the results of tomorrow exceed his expectancy or belittle his forethought, for one must see a thousand things at once and sense their interrelation.

There must be a point from which a start may be made. Let it be the activities of the past two or three years and, accepting the tendencies since then as a prognostic aid, let us endeavor to project a word picture of the future of operative dentistry.

Since 1852, when the chair of practical dentistry in the Baltimore College of Dentistry was divided into mechanical dentistry and operative dentistry, this phase of practice has had a name. I have asked myself and many others this question: What is operative dentistry? The answers have been numerous and usually unsatisfactory.

What its limitations are no one has been able to define successfully. It is undoubtedly more broadly inclusive than any other designated part of dentistry, even though prosthesis has presumed to encompass all restorative art.

Prosthesis does not cover the service usually classed as operative dentistry, and those engaged in it have become so completely absorbed in their pet problems, such as full denture restoration

and the theories of occlusion with apparatus, that operative dentistry again comes forward for recognition, redefinition and perhaps reinvigoration.

Stepping out on its courses and calling "Fore," it is ready to address the problem, realizing the hazards and impediments that lie before it and occasionally getting out of bounds, yet, with stroke and putt, it is endeavoring to perfect its game and make a score that will startle Colonel Bogey.

Realizing that the regular and associate membership of the Chicago Dental Society is widely representative geographically, I felt that an expression of opinion from an equally large territory might shed some light on the question assigned to me, and I, therefore, asked for such an expression covering activities in education, research and practice from a number of men in various places in North America. This method may have been more diplomatic than acceptable, for each of you may find something in the paper with which you agree as being in accord with the practice or expectancy in your territory, while you may disagree with other points of view.

Friesell,[1] in a recent article, states, "The basis of general practice is operative dentistry. Its true function is to so care for the patient's teeth, starting in childhood whenever possible, as to make unnecessary most of our present specialties." If this is true, then the general practitioner should be able to give the best answer to the questions; but such seems not to be the case.

In response to the query, Kells, of New Orleans, says, "Why, the operative dentistry of the future lies in the hands of the deans of our dental colleges—upon the college graduate of today depends the future of dentistry, and you deans have a heavy responsibility upon your shoulders—you really have."

Of forty deans of dental colleges in the United States and Canada, seventeen are professors of operative dentistry. Only eight of the seventeen teach operative dentistry exclusively. Are all the others sufficiently well informed and have they the vision of the future of operative dentistry to cope with the problem? Shall the deans be entrusted with all of this heavy responsibility?

Speaking of the absence of such vitalizing forces as postgraduate courses, research institutes and endowments in the southern territory, Kells further states that, while intentions are good, hope has been practically abandoned and "problems cannot well be solved and there's no one to whom we can take them." Sad, is it not?

Miner, of Boston, says that dentistry is essentially a public health problem and that the education of the public and the education of the profession itself, developing men for research work in dentistry, are the hope of the future for dentistry.

Among his associates, Taylor says:

> The tendency in dental education in New England is toward the stressing of the preventive and oral hygiene sides with the reparative side as necessary for the present Research is also being conducted along the line of preventive rather than reparative dentistry, including the investigation of the effects of diet on the bony structures, as conducted by Dr. Howe.
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> In practice, (*a*) the elimination of septic areas about the teeth, (*b*) conservative treatment of nonvital teeth (with definite limitations), (*c*) a lessening emphasis on the gold inlay and on silicate cements used in an indiscriminate manner, (*d*) a getting away from extreme curetting of infected tooth sockets after extracting, represent the usual procedures.

Another associate, Dill, says: "The cast gold inlay still stands supreme for extensive restoration of lost tooth structure

1. Dental Summary, April, 1924, Vol. 44, p. 278.

but many of us believe it has been overdone. In regard to root-canal operations, one result at least of the controversy is that the present day graduate and those older men who try to keep abreast of the profession are doing much better root-canal work than prevailed before Hunter drew up his indictment against the profession."

He also believes that "the forward looking men of the profession feel that the ravages of decay can only be controlled by the education of the public to the point where the expectant mother will receive the proper diet to build sound tooth structure, and it will be in this field that dentistry will make the greatest advancement in the future."

Tingley and Dulac concur in a general way with the foregoing statements, indicating the tendency in New England.

Prime, of Omaha, says that "the two schools of our state are requiring more operative work and of a better quality."

Studying pits and fissures for the past five years, he has developed a method for immunizing and a technic for filling that requires but little cutting in cavity preparation. A paper on this subject was presented recently at Dallas. Does this not indicate that quite all dental operations fifty years hence may be performed painlessly, a development which we can look forward to with pleasure?

Prime further states: "For the past five years, I have made an effort to have dentists take their eyes off the apical end of the root and focus them on the crown of the tooth, where the trouble begins."

Commenting on the activities of the well and widely known study clubs of the Mississippi Valley, whose activities have been confined exclusively to gold foil operations for so many years, he states: "This part of the United States has perhaps more interest in this work and more high class operators than will be found in any other part of the country."

Can we ever measure the value, inspirational, technical and educational, of the teachings of that master, G. V. Black, whose work in this field has left such an indelible impression on dentistry that it seems ineradicable? His influence extends to the most remote places on the globe. What will be said of these methods a thousand years hence?

Tileston, of Louisville, speaks of the splendid cooperation between societies and schools and of the development of research and the tendency to specialization in practice, but does not indicate the tendencies in operative dentistry.

La Touche, of Los Angeles, says: "As we view it in the line of the present preventive trend, operative procedures in the future will of necessity be more refined in nature. So far as we can anticipate future needs, our educational activity should be that of a more careful observation in the technic of cavity preparation as well as filling material manipulation, until our research activity produces that which we have long sought, the ideal filling material. It is our belief that it is the material we have to look to as the factor effecting any considerable change."

Thornton, of Richmond, says:

I believe the future of operative dentistry will depend very largely on the research work that is being carried on. Much is being done in Virginia to educate the people in a practical sort of way. Our state board of health is so constituted that there must always be at least one dentist on the board. This appears to be a recognition by the state of the importance of dentistry.

The mouth hygiene division of the department of health has at present a staff of thirteen dentists. The effect of their work is readily seen, not only in actual work accomplished but in the changed attitude of the people whom they serve. As this educational work progresses, it would seem that the need

for prosthetic work should diminish and the field of operative work increase.

One other important factor that appears to be making progress is the emphasis that is being placed on the care of the deciduous dentition. I feel that it is becoming more generally recognized all the time that restorations in the deciduous teeth should be given as much care as those in the permanent dentition.

The field of research in operative dentistry is wide open. There is not a filling material on the market that comes near fulfilling the requirements of a restorative material.

Pettibone, of Cleveland, says: "The research men seem rather beyond the practical application of operative dentistry. They, of course, are leading the way for us and I believe our future will be largely governed by their discoveries. . . Good practice among my neighbors includes thorough prophylaxis including checking dentifrices and methods of brushing the teeth and a complete x-ray examination of the mouth to insure finding all cavities and avoid operating on questionable teeth. Foil is almost obsolete, as is the devitalization of teeth and the treatment of abscessed teeth, the latter being almost universally confined to the single rooted teeth."

Perhaps his best statement is this: "You may be interested to know that my associate and I, each of whom has been practicing over twenty years, made a survey of every operative procedure and we found that our methods in every case were different from those we learned and used when we were in college. We failed to find even one instance in which our technic was the same."

Simonton, of San Francisco, says: "The two points of view on this question are the ideal and the practical. The ideal point of view is this: How can the present modus operandi be made more nearly to approach perfection? The practical point of view is: The knowledge and skill in operative procedure is far beyond its application." He further states: "I believe that the conscientious application of all that we know of operative dentistry at the present time calls for a degree of character, physical strength, indefatigable industry and an unalterable grip of mind that only a few men are born with."

It would seem then that the future of operative dentistry depends on the race rather than on the profession.

Simonton also believes that metallurgic and metallographic work indicates the need for a more advanced knowledge of filling materials so that a better understanding of the metallic inlay problem will enable us to render our service with less discomfort to our clientele. "At present, research also indicates that the elucidation of the far-reaching effects of caries is intimately associated with the greatest of all problems, the prevention of dental caries. The control of defects common to all filling operations offers a new method of approach to the accomplishment of one of the chief objects of filling teeth, namely, hermetic sealing. This may profitably occupy a larger part of the time and study in operative dentistry. Immediate problems include a more thorough histologic study of the enamel, especially the gingival fragments, to determine structural defects and technical injuries after operations in order that more permanent results may be assured. The x-ray may be valuable in this respect."

William J. Gies has recently stated that "American dentistry has attained world leadership in all the operative phases of the art."

Can we retain this supremacy? If so, how? Or shall we gradually respond to the demands of preventive dentistry and acquire new laurels by maintaining, as nearly as possible, a perfect dentition for the American people throughout life?

Referring again to the three distinct, yet correlated, aspects of the problem, namely, education, practice and research, and reviewing the tendencies in each of these, may I endeavor to draw a composite picture of the future of operative dentistry?

EDUCATION IN OPERATIVE DENTISTRY

Dental education as a whole appears to be in a chaotic condition, just as some other types of professional education are; yet the several departments in purely dental subjects such as crown and bridge prosthesis, exodontia and operative dentistry are apparently progressing favorably toward a more thorough understanding of the content of their respective subjects and a higher degree of professional fitness than might be expected under such conditions.

Perhaps this is the very reason for the chaos. Each department, adding to its knowledge every year, endeavors to amplify its teaching activity under the perfectly normal delusion of its relatively greater importance, and all other departments are ignored or their instruction is minimized in value. I believe there is little effort toward real coordination among teachers in most universities.

Whether the advancement in the training period in dentistry will alter dental practice fifty years hence depends on how quickly the dental schools decide on a stable educational plan and then on how long they stay with that plan.

The profession has hardly yet had time to judge of the fitness or superior skill of the four-year graduate. The graduate with one year of academic training is not yet engaged in practice, and the proposal to change the course from one year of academic preparation and four years of professional training to two years of academic preparation and three years of professional training will probably reduce the technical skill of the student, while the academic period is not sufficiently long to amplify his knowledge of the medical sciences materially. Neither of the latter plans will adequately solve the problem, in my opinion.

It may be said that the narrower the limitation of dental practice, the greater the pressure for a complete and thorough understanding of a knowledge of it, and operative dentistry with its broad range of service is more liberal in its teachings and in its demands on the student.

If this broader range of service in a dentist's practice can reasonably be called operative dentistry, how shall it be divided for purposes of instruction?

Phases of dental practice naturally group themselves into divisions, and these indicate the tendency in teaching. Each of these phases requires a special technic, a special type of equipment, a single sitting or a series of sittings; and men become generally proficient by practicing all of them, or especially proficient by practicing but one of them.

Thus, cavity preparation with the insertion of filling materials may appropriately be considered as constituting the major portion of operative dentistry, and since it is all quite technical in character it is designated as "operative procedures" by some teachers.

Mouth hygiene, periodontia and root-canal therapy each require an entirely different type of equipment and technic, and not infrequently some medication; yet each can be taught separately in the department of operative dentistry with profit to the student.

While mouth hygiene and periodontia are considered by many as the most important phases of preventive dentistry, they are so only in direct ratio to the age at which such service is rendered to the patient and the character of that service.

By some teachers, the fitting of porcelain shell crowns is considered as within the field of operative dentistry. Such individuals may also include full or three-quarter veneer gold crowns, since the major part of the service is rendered at the chair and the instruction is thus included in operative dentistry.

Unquestionably, the finer developments of ceramic work will be prominent in future dental practice, for no more beautiful or serviceable restorations have been made than these and no substitute has yet held a position for more than a brief period among the skilled operators and leading practitioners.

Education in this field must be extended chiefly as graduate or postgraduate work, since no curriculum is capable of including all that should be known about each phase of the practice of dentistry within that period of time during which the average individual may fit himself for practice, whether it be four or eight years. This field commands a high degree of skill in dental art.

Children's dentistry by some institutions is included as a section or division of operative dentistry, chiefly because very little prosthesis is resorted to. The line of demarkation between the child and the man has been the subject of controversy between the pediatrician and the physician for a long time. In dentistry, it can be differentiated quite easily on account of the dentition, and many pedodontists aim to transfer their patients to the family dentist when the permanent teeth, with the exception of the third molars, are erupted.

It is appropriate that dental education should take cognizance of several things in this connection.

1. Children deserve more and better dental care than they receive either at home or from the profession.
2. Dental disease, occurring chiefly in childhood, is largely preventable, and our educational and professional service should begin here.
3. The economic loss to the nation through dental disease and its sequelae and, in part, the physical fitness of the American people is the responsibility of the dental educators. For various reasons, they are not living up to this responsibility.

In many of the dental schools, a department of children's dentistry has been established, and certain requirements are demanded of the student before graduation. In addition, other courses of instruction are offered in an attractive form to such students as are interested, and it is surprising to find how many are enthusiastic about it.

DENTAL RESEARCH

Whenever research is mentioned in dentistry, the natural inclination is to think of the so-called medical sciences, because most dental research in the past has been centered there. The practical dentist is inclined to look with skepticism on it. If he lacks the preparation in these sciences, he does not readily comprehend the reports and again he desires a practical application for everything. On the other hand, a fluent salesman can sell him therapeutic reagents, alloys and apparatus of which he or his professional colleagues know nothing, even though the sale is made on the basis of research in medical or other sciences.

Not all research in operative dentistry is, nor should it be, confined to the the medical sciences. The physical substitute for gold in dentistry would save enough gold to the nation in ten years to endow every chair in operative dentistry in America handsomely; yet we go on

with little or no effort to obtain it. The only source of a larger profit in gold to the manufacturer comes through debasing it, for we can all buy pure gold at mint prices. In debasing gold for dental purposes, the largest profit is made by introducing the least expensive metals that will either improve the desired properties of the gold alloy or will not detract from it. An ounce of gold alloy containing 60 per cent gold and 6 per cent platinum represents $12.40 worth of gold and $7.00 worth of platinum at present market quotations. If the balance of the alloy is silver, the additional cost of the metal would be 0.23 cents, and if it were copper, the additional cost would be 0.003 mills. What do you pay an ounce for these alloys? Competition has increased the advertising and the salesman's efforts, but of the marketed products we know little except by trade name or number.

At present, no particular research is being fostered by special grants in these fields, though some work is being done at the universities of Minnesota and California.

There is no reason why information relating to these materials should not be placed at the disposal of those interested in operative dentistry, if they want it.

For our instruments, we have depended chiefly on dental inventors, usually with secretive instincts, rather than on research workers.

Whenever the products of either type of investigator were an approximate infringement on something nearly as good, not infrequently the patent was bought by the manufacturer and buried, because new dies, chucks and tools would have to be made to produce them. On the other hand, when some individual with an outstanding personality and an idea desired to incorporate the idea in a set of instruments, manufacturers would devote much energy and money to the problem, with the customary expectancy. All research or experimental work by dental manufacturers for dentists is paid for by the dental profession, unless the concern goes bankrupt, when the stockholders pay the bill; yet the dentists have nothing to say about what is manufactured.

Research during the war on steel alloys produced remarkable results. With few exceptions, little has been done in dentistry to take advantage of these discoveries, yet any effort to improve instruments that will enable the dentist to prepare the teeth for the reception of a filling material or for a restoration in less time and with less discomfort to his patient will be welcomed by the operator. Unquestionably, research relating to these problems in the future will bring dependable information to the profession.

The use of the roentgen-ray as a diagnostic aid will increase in the future, and while it may not be legitimately included in operative dentistry, its importance as an adjunct is accepted. The ability to duplicate roentgenograms exactly at various intervals of time is important, and a mechanical device to accomplish this will soon be presented to the profession.

Research in the field of economics is not the least important of our problems, and it is related to operative dentistry in direct ratio to the volume of one's practice in the field. Efficiency methods including a job analysis of dentistry and a psychanalysis of the dentist, if I may be permitted to use the words without being called a pseudopsychologist, will perhaps lessen the nervous tension of the average patient and increase the output of the dentist.

The Surgeon General of the United States Public Health Service has under-

taken an economic or statistical analysis of the volume and cost of dental service in this country. The information is not to be had without further study, and when it is available, it will be more valuable to the practicing dentist than to anyone else. State dental societies can well afford to pursue such an investigation through questionnaires, for the benefit of their membership.

DENTAL PRACTICE

Fifty-five or sixty thousand dentists are practicing in the United States today. How are they practicing dentistry? How many of them will be practicing dentistry twenty-five years hence? How will they practice it then? Is that not a challenge to one's imagination?

Perhaps you little realize how much the full-time dental teachers depend on the dental practitioners for the supplementary information that indicates the way we are going. The teacher who practices dentistry for his major income is the source of this information. He brings to his faculty the results of his practical experience, and for that reason, the balanced faculty, with the dominance in favor of the clinical teacher engaged in practice, is best, in my opinion. As long as dental schools are engaged in teaching men to practice dentistry, such conditions should prevail; for the direct transmission of the art of dentistry from teacher to pupils has always been the most successful method, and the dentist who has not practiced does not, as a rule, possess the art in such a high degree. That is the reason your clinics are always so well attended.

The teacher, on the other hand, comes in contact with more general practitioners and knows more about what they are doing than the isolated dentist. By the nature of his calling, the teacher must know the minute details of his art and science. The practitioner is expected to know them, but is not called on to give evidence of it daily. The results of the latter's experience, good or bad, help to shape the destiny of dental practice.

Study clubs that concentrate every effort on a single problem such as gold foil or full dentures furnish much detailed information to the teacher; yet if the teacher relied on such sources for all his knowledge of the practice of dentistry, such knowledge would remain static, and practice could make no progress. Study clubs are primarily intended for the development of the individual who hopes to equal the art of his leader or preceptor. They have strengthened dental practice tremendously within their limitations, and not infrequently members digress into other fields of endeavor and contribute new thought to our profession. Dental practice in the future will undoubtedly continue to influence the point of view and the orders of procedure presented by the teacher, though the method of presentation will ever be his own. The future of operative dentistry thus rests largely with the practitioner.

A further study of retention and resistance forms and of the stresses and strains of mastication is to be expected in dental practice; for the dentist with a practice covering three generations in as many decades can add much to our knowledge that is not to be obtained in any other manner. Complete records substantiating such clinical research are as necessary as they are helpful.

Occlusion is a term commonly used by all dentists. Do we comprehend its meaning or has it ever been defined satisfactorily? Is it the basis of diagnosis in dentistry? Do the full denture prosthetist and the orthodontist mean the same thing when they speak of occlusion?

Operative dentistry has excellent reason to pursue a study of this problem

with avidity; for single operations may cause the destruction and loss of a tooth or may wreck the entire arch, if occlusion is not well understood. This subject then will be much discussed in the future, for, if the purpose of dentistry is to save teeth, a study of occlusion will be the most important part of the training of the dentist.

If, as has been expressed by several individuals, the most important step will be in the field of prevention, we may expect the greatest changes in dental practice to arise in that field.

Present tendencies indicate that we will have to include the treatment of all children in our practice and that we will have to see them at frequent intervals. We must do this ourselves or provide for it in our offices; for unless we do, someone else will be found who will take care of the children.

We must pay particular attention to the expectant mother, in order that she may survive the child-bearing period with sound teeth, if she possesses them at the beginning, and we must convey the story of proper nutrition for the fetus and the infant to her in terms clear to her understanding, if we would insure the necessary foundation for health through metabolic processes. We have learned enough in the last few years to convince us of the value of dietetics and hygiene as factors in the prevention of dental disorders, but we must not be carried away by enthusiasm, expecting them to be the assured agencies guaranteeing the health of the individual.

I hesitate to trespass on the field of medicinal therapy, though it is appropriately within the scope of this paper. We need so much information on this subject and so much protection against our own ignorance that no more fertile field of investigation is open to dentistry than, first, the remedies that are furnished to dentists and the public for their respective uses and, second, the remedies that will best serve our purpose in treating lesions of the oral cavity.

Silver nitrate is used quite extensively, both as an inhibiting agent or germicide in shallow grooves and fissures in children's teeth and as an escharotic on denuded vital teeth prepared to receive full or partial veneers, to prevent the ingress of micro-organisms. Has this valuable reagent ever been studied carefully enough to determine its benign or destructive influences? Prinz says that silver nitrate applied to the tongue or mucosa may be the means of stimulating an inward growth of epithelial tissue, which may become malignant. Operative dentistry, above all things, should be cognizant of such hazards and should strive to prove its knowledge in these fields first in order that its teachings may be sound. A lack of information in the field of medicinal therapy justifies the appointment of a number of research fellows in our educational institutions, the results of whose work will be available to the profession directly rather than through commercial channels.

In reviewing this paper, I am reminded of the ancient methods of teaching medicine, when all knowledge extant was transcribed on parchment and diffused at various medieval centers of learning by word of mouth. The process further required a disputation on a subject about which the disputant knew probably as little as I know about operative dentistry; yet, from these disputations and dissertations, there has developed, in the all inclusive field of medical science and public health, a knowledge and an experience so rich in accomplishment that the comfort and the happiness of the entire mammalian kingdom is largely dependent upon it.

I trust the message has at least been suggestive and interesting.

THE PULPLESS TOOTH FROM A BACTERIOLOGIC AND EXPERIMENTAL STANDPOINT

By RUSSELL L. HADEN, M.D., Kansas City, Missouri

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

THE thoughtful clinician, in evaluating the pulpless tooth as a factor in disease, asks three questions: 1. How frequently is the pulpless tooth infected; how far can one translate roentgenographic evidence of infection into terms of bacteria? 2. Are the bacteria found in areas of dental infection able to produce disease; if so, with what frequency? 3. In individual cases, what experimental proof is there that a focus of dental infection bears a causal relationship to the patient's symptoms? The answer to these questions must constitute the scientific basis for determining the rôle that dental infection plays in the causation of chronic infectious disease. The problem is largely a bacteriologic one; yet it is surprising how little data is available concerning the points mentioned. There is not in the literature a single comprehensive bacteriologic study of dental infection by modern methods; relatively little work has been done to determine the pathogenicity of mouth streptococci by the correct technic; very little experimental proof concerning the causal relation of a focus to a disease in individual cases is available except that of Rosenow and coworkers and of Price.[1] I have attempted by cultures of dental infection and by certain animal experiments to obtain further facts in answer to the questions asked. These data are presented herewith.

THE BACTERIOLOGIC STATUS OF THE PULPLESS TOOTH

To determine, if possible, the exact bacteriologic status of the pulpless tooth, we have cultured the apices and periapical tissues of a large number of pulpless teeth. A quantitative technic has been employed by which the number of bacteria present in the tissues cultured can be determined. The extractions have all been performed by Dr. Charles W. Keeling and Dr. Carl D. Lucas, whose cooperation has made possible this study. The technic used in obtaining the culture material is as follows: The teeth are first thoroughly scrubbed with gauze, and the gums are then painted with tincture of iodin, followed by alcohol. The field of operation is packed off with sterile gauze and the tooth extracted with sterile forceps. The apex of the tooth is cut off with ster-

1. Price, W. A.: Dental Infections, Cleveland, Penton Publishing Co., 1923.

ile forceps directly into a sterile tube containing about 1 c. c. of salt solution and a small amount of sand.

In making the bacteriologic cultures, we have followed closely the technic of Rosenow. Each tooth has

Fig. 1.—A deep tube of glucose-brain-agar used in quantitative cultures of dental foci. The large number of colonies that are distributed throughout the tube may be noted.

been cultured in deep tubes of glucose-brain broth and glucose-brain-agar. These mediums afford all degrees of oxygen tension and are thus especially favorable for the growth of the streptococci found in chronic focal lesions. The technic used in the preparation of the mediums has been described in detail elsewhere.[2] The tube containing the root tip in the sterile sand and salt solution is well shaken to macerate the tissue on the tip of the tooth as completely as possible. The mediums are inoculated by pouring the salt solution containing the suspended tissue into a deep tube of glucose-brain-agar that has been heated and allowed to cool to 40 C. The small amount of salt solution remaining in the tube is then poured into a tube of glucose-brain broth. The inoculated tubes are incubated at 37 C. for from twenty-four to forty-eight hours. The agar tube is employed only to determine the number of bacteria present. The appearance of such a positive culture is shown in Figure 1. Smears are made from the broth tube to determine the type of organism, and the broth culture is then used for animal inoculation.

In the statistics to be presented, I have included cultures of the incisors, cuspids and bicuspids only, since extractions of the molars without mouth contamination is often quite difficult. The different steps in the technic have been repeatedly checked bacteriologically to detect possible errors. As a further check on technic, I have constantly cultured vital teeth to determine the percentage of error.

The results of the cultures of 1307 teeth, made in the manner outlined, are shown in Table 1. I have not included in the series any teeth in which there was a question of contamination from saliva, lips, tongue or otherwise at the time of extraction. Likewise, I have excluded teeth showing pyorrhea. The teeth cultured are fairly

2. Haden, R. L.: Arch. Int. Med., 32: 828 (Dec.) 1923.

TABLE 1.—RESULTS OF QUANTITATIVE CULTURES FROM PERIAPICAL DENTAL INFECTION.

Group	Number Cultured	Number Showing in Deep Agar Tube			Number Sterile in Broth Per Cent
		One or more colonies Per Cent	Ten or more colonies Per Cent	More than 100 colonies Per Cent	
Vital teeth	392	14	5	1	46
Pulpless teeth with negative roentgenogram	490	54	44	24	18
Pulpless teeth with positive roentgenogram	425	70	63	44	9
All pulpless teeth	915	61	51	33	14
Total	1307				

equally divided between vital teeth, pulpless teeth with negative roentgenographic findings and pulpless teeth with positive roentgenographic findings. Three hundred and ninety-two vital teeth have been cultured. Of these, 14 per cent have shown one or more colonies in a deep agar tube; 5 per cent, ten or more colonies, and 1 per cent, more than 100 colonies. It seems reasonable to take ten or more colonies as an arbitrary number, as indicating sufficient infection to be of possible importance from a systemic standpoint. These results indicate also the percentage of error that must be allowed for in interpreting the results in pulpless teeth. The positive cultures do not all represent errors in technic. Some of the teeth considered as vital were probably pulpless since all were not tested for vitality and others had large cavities and might well have already had infected pulps. Of the broth cultures from these teeth 46 per cent were sterile.

Four hundred and twenty-five pulpless teeth with positive roentgenographic findings are included. Of these, 70 per cent showed one or more colonies in the deep agar tube; 63 per cent, ten or more colonies, and 44 per cent, more than 100 colonies in the deep tube. Nine per cent of the broth cultures in this group were sterile. The significant findings here are the fact that 37 per cent of the teeth with positive roentgenographic evidence of infection showed less than ten colonies and 9 per cent were sterile in broth. It is evident that, in many cases, the infection had run its course and healing had taken place as far as the bacteria are concerned.

Four hundred ninety pulpless teeth with negative roentgenographic findings have been cultured. Fifty-four per cent of these have had one or more colonies in the deep agar tube; 44 per cent, ten or more colonies, and 24 per cent, more than 100 colonies. Eighteen per cent were sterile in

broth. I realize that there may be much discussion and difference of opinion concerning what roentgenographic criteria should be employed in placing teeth in this group. We have taken a conservative attitude as to what is positive or negative. The striking thing here is the high percentage of positive cultures. The incidence of infection is almost as high as in those with positive roentgenographic findings. Infection in the tooth with negative roentgenographic findings is probably more serious from the systemic standpoint than when the findings are positive, since little resistance in the part of the body is indicated and absorption is probably more rapid. The organisms recovered have been streptococci in pure culture or mixed with staphylococci. Only rarely have other organisms been encountered.

I should like to emphasize that cultures so made show only the bacteriologic status at the time the culture is taken. They tell nothing as to what was there yesterday, or what might be present hereafter. It must also be granted that some of the negative cultures might have been positive if developed in other ways, although the mediums used are the most favorable known for the growth of nonhemolytic streptococci. Several times during the past two years I have compiled statistics concerning the cultures and the percentages have remained almost constant.

These results show that infection is actually present around the root tips, tell something about the frequency of the infection and give an idea of the number of bacteria present. They also show that roentgenographic findings, while of aid, cannot be translated into terms of bacteria; nor can infection around the tip of a pulpless tooth be ruled out on a roentgenographic basis.

THE PATHOGENICITY OF THE BACTERIA FROM DENTAL FOCI

To determine the disease-producing power of the bacteria from dental foci, we have injected rabbits with the original broth cultures recovered from the root tip. Two rabbits have been injected routinely with 5 c. c. each of the culture from a single tooth or with the mixed cultures from several teeth. In most instances, the animals do not die as a result of the injection. If they do not, they are killed at intervals of from three to six days after the injection, and the various organs are examined carefully for lesions.

Other workers, of course, have determined the pathogenicity of mouth organisms by the injection of cultures into animals. Such a study is that of Hartzell and Henrici.[3] However, most workers have not used, for the injection, organisms grown under partial oxygen tension, or made the injections soon after isolation. These points are vital if one is to determine the true pathogenicity of the organisms. Disease-producing power in the group dealt with here is quickly lost when these fundamental requirements are not met.

We have been able to reproduce in rabbits almost all types of lesions that can be caused by the intravenous dissemination of bacteria. The fre-

3. Hartzell, T. B.; Henrici, A. T., and Grey, W. A.: Report of the Mouth Infection Research Corps of the National Dental Association, J.N.D.A., 3: 333 (Nov.) 1916.

TABLE 2.—LOCALIZATION OF BACTERIA ISOLATED FROM DENTAL INFECTION. (INTRAVENOUS INJECTION IN RABBITS)

Number of Animals Injected	Number of Patients	Percentage of Animals Showing Lesions in							
		Joint	Kidney	Muscle	Endocardium	Myocardium	Brain	Eye	Stomach and Duodenum
761	255	58	34	24	18	11	6	18	13

quency with which the main groups of lesions occur is shown in Table 2. The lesion most commonly encountered is joint involvement; the second, kidney lesions; the third, muscle; followed by lesions of the endocardium, myocardium, brain, eye, and stomach and duodenum. The incidence of involvement in the animal corresponds closely to the incidence of lesions due to chronic foci as observed clinically in man. In addition to the lesions enumerated, many others have been observed, such as tenosynovitis, cholecystitis, enteritis, bladder involvement and nerve lesion.

The high incidence of lesions shows clearly the great disease producing power of the bacteria from chronic foci and leaves no doubt that such organisms are capable in a high degree of causing disease in man.

EXPERIMENTAL PROOF IN INDIVIDUAL CASES OF A CAUSAL RELATIONSHIP OF DENTAL INFECTION TO SYSTEMIC DISEASE

The data so far presented give, in individual cases, no proof of a causal relationship of dental infection to systemic disease. Certainly, the most convincing proof we have of the relation of a focus to a disease is the reproduction in animals, with the organism recovered from the patient's focus, of the condition from which the patient suffers. Such proof concerns the theory of Rosenow that bacteria tend to localize in certain tissues of the body owing to some peculiar inherent property. The truth of the theory has been conclusively demonstrated by Rosenow and his co-workers. I have been able to present confirmatory results in diseases of the eye,[2] the stomach,[4] and the kidney,[5] and in cases of onychia.[6] The proof seems absolute that bacteria do have such a selective tendency. Those who have questioned the theory after experimentation have failed to observe the necessary requirements as far as oxygen tension and rapidity of work is concerned. The demonstration, then, that animals injected with the bacteria develop lesions similar to those of the patient is the strongest evidence as to causal relationship and likewise evidence that, in the patient and in the animal, we are dealing with the same organism. The proof that, in certain cases, there is this causal relation of

4. Haden, R. L.: Arch. Int. Med., 35: 457 (April) 1925.

5. Haden, R. L.: Am. J. Med. Sc., 169: 407 (March) 1925.

6. Haden, R. L., and Jordan, W. H.: Arch. Dermat. and Syph., 8: 31 (July) 1923.

dental infection to systemic disease is best presented by a few cases histories, with the protocols of animal inoculations with the organisms recovered from chronic dental foci in the patient. These are given herewith.

REPORT OF CASES

CASE 1.—*Endocarditis and Auricular Fibrillation. History.*—L. C. H., a widow, aged 60, working as a clerk, complained of heart trouble. She had had chorea first

Fig. 2.—Large vegetations on the heart valves of a rabbit produced by the intravenous injection of culture from the teeth of the patient in Case 1, who was suffering from auricular fibrillation and aortic insufficiency.

at 12 years, with recurrent attacks for several years. At 14, she had had diphtheria, and at 23, scarlet fever. Eight years before, she had had scleritis. For several years, she had albumin and pus in the urine. At one time, removal of a kidney was considered on account of the pyuria.

The patient stated she had been well up to 1912, eleven years before admission, when she had a severe attack of influenza. Two weeks later, she began to have arthritis, which persisted for six months. She was then well for several months, after which she began to have attacks of rapid and irregular heart. She had to give up work for seven weeks at this time on account of heart symptoms. About once a year, since this initial attack, she had had an attack of heart trouble, incapacitating her for work for from six weeks to four months. During the past year, the attacks had been occurring every few days, lasting a few days at a time. The symptoms were worse on exertion. At times, the ankles were swollen. Recently, the patient had been to the Mayo Clinic, where a diagnosis of paroxysmal auricular fibrillation was made.

Examination.—On admission, there was a definite aortic insufficiency without demonstrable cardiac enlargement. The heart rate was slow and regular except for an occasional extra systole. The blood pressure was: systolic, 140; diastolic, 70. The urine showed a few pus cells in clumps.

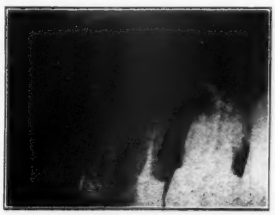

Fig. 3.—Pulpless teeth of patient in Case 2, who was suffering from severe subacute arthritis. A profuse growth of streptococci was obtained from both teeth. The organisms on injection produced a marked arthritis in rabbits. The patient recovered completely after the removal of the infection.

There were eleven pulpless teeth, only four of which showed definite roentgenographic evidence of infection.

Animal Inoculations.—The lower right second bicuspid and first and second molars were extracted first. All showed a profuse growth of nonhemolytic streptococci. Two rabbits were injected. One had, at necropsy, a few endocardial vegetations, a few abscesses in the medulla of the kidney and a small amount of purulent fluid in the joint. The other rabbit showed a massive vegetative endocarditis of the tricuspid valve (Fig. 2), a few lesions in the myocardium, and slight involvement of the joints. One

rabbit was injected with the cultures from the lower left bicuspid and second molar. At necropsy, a few vegetations on the heart valves, numerous small abscesses in the wall of the left ventricle, a purulent arthritis and a few kidney abscesses were found. Two rabbits were injected with the cultures from the remaining teeth. One was dead the following day. There were many hemorrhages in the endocardium of the left ventricle, and at the base of the papillary muscles. There were also a few hemorrhages and small vegetations in the right auricle near the ventricle.

The other rabbit died two days after injection. At necropsy, only early vegetations on the mitral and the tricuspid valves, and mural thrombi in the right auricle were found.

CASE 2.—*Chronic Arthritis. History.*—R. K., a salesman, aged 27, complained of rheumatism. He had never been sick until the present illness. The tonsils had been removed in 1919, four years before. The present illness had begun four weeks before admission, with an eruption on the hands and trunk followed by an arthritis of the right wrist.

Examination.—When the patient was first seen, all the larger joints and the finger joints were red, painful and stiff, and he could walk only with the aid of crutches. The eyes were injected and painful. There was a raised pink macular eruption with clearing centers over the shoulders, arms, chest and back, resembling erythema multiforme. The leukocytes numbered 13,350. The urine was negative and the Wassermann test negative.

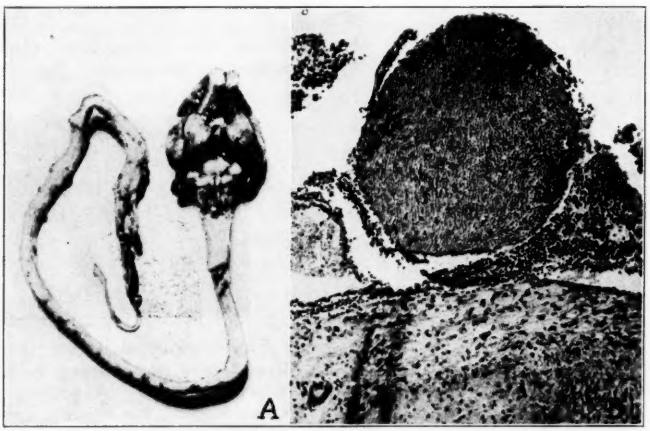

Fig. 4.—*A*, brain and spinal cord of rabbit injected with cultures from the teeth of a patient suffering from acute facial paralysis. There is marked injection of the base of the brain and injection and hemorrhage in the caudal end of the cord; *B*, photomicrograph of one of the cranial nerves at the base of the brain shown in *A*. The exudate at the base of the brain partly encircling the nerve may be noted.

There were only two pulpless teeth, both of which showed a profuse growth of green-producing streptococci (Fig. 3).

The patient had come in on crutches. He felt better immediately after the teeth were extracted. The following day, all the joint symptoms had disappeared. Two days later, he came in again on crutches. Examination showed that the sockets were not draining, and they were opened again. The symptoms disappeared immediately and did not return. The skin eruption also cleared up quickly.

Animal Inoculations.—Two rabbits were

injected. Both, at necropsy, had a marked purulent arthritis and kidney abscesses. The organism injected was recovered in pure culture from the joint and kidney lesions.

CASE 3.—*Acute Facial Paralysis. History.*—L. M. H., a plumber, aged 39, complained of facial paralysis. One year previously, he had suffered from dizzy spells, and, on examination, was found to have albumin in the urine. The facial paralysis had appeared suddenly five days before without any pain.

Examination.—The right side of the face was found to be completely paralyzed. No other cranial nerves were involved. The blood pressure was: systolic, 130; diastolic, 85. There was no anemia. The Wassermann test was negative. The urine examination showed a specific gravity of 1.023, and albumin four plus, with many granular casts. The phenolsulphonephthalein excretion and the blood urea nitrogen were within the normal limits. The dental roentgenograms showed four pulpless teeth, all presenting evidence of periapical infection.

Animal Inoculation.—Three rabbits were injected with the mixed cultures from the four extracted teeth. One developed a paralysis of the hind legs forty-eight hours after injection and was killed. At necropsy, all organs were negative except the brain and spinal cord, which showed marked injection, some exudate at the base of the brain (Fig. 4) and hemorrhage in the caudal end of the cord. The second rabbit showed no symptoms at any time, and, at necropsy, only some vegetations on the heart valves were found. The third rabbit, two days after injection, had paralysis of the left ear and a pericorneal injection, which gradually cleared up. When the animal was killed, the only lesions found were a purulent arthritis.

CASE 4.—*Recurrent Hyalitis. History.*—L. P., a steam fitter, aged 25, first seen, June 25, 1920, complained of something flying around in front of the right eye. This was first noticed about three weeks previously, following an attack of influenza, and had become gradually worse.

Examination and Course.—The fundus was not clearly seen. No hemorrhages were present. Many fine dustlike opacities and some larger ones were floating freely in the vitreous humor, also shreds of hyaloid tissue, to which were attached numerous dustlike opacities. There was no opacity of any kind to be found in the aqueous humor or on the back of the cornea, and no inflammation was apparent. Vision in the right eye was 20/100.

Under treatment, the vision became better, 20/50, and at one time 20/40. Between June, 1920, and February, 1922, the patient had four light attacks, and one severe one, which left the eye almost without a reflex. These exacerbations did not come on suddenly as they would have if they had been recurrent hemorrhages. From the time of his first visit, the patient was urged to have all his pulpless teeth extracted, but several were not removed.

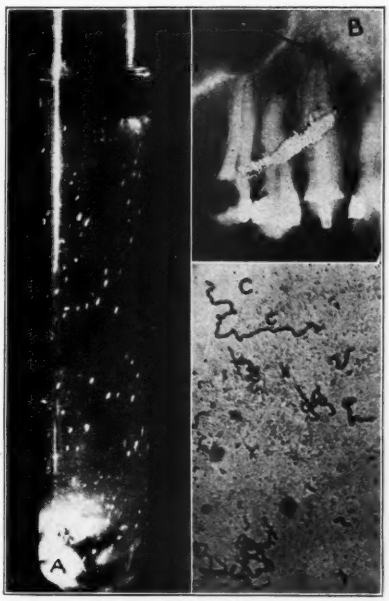

Fig. 5.—*A*, original culture tube from the tooth shown in *B*, the tooth of the patient in Case 4, who was suffering from hyalitis; *C*, photomicrograph of the organism in the agar tube at left.

A general physical examination, Feb. 24, 1922, was negative. The tonsils had been

removed. Examination of the blood revealed: red cells, 4,632,000; hemoglobin, 90 per cent; white cells, 7,400; differential count: polymorphonuclear neutrophils 55.5 per cent; eosinophils, 4.5 per cent; basophils, 2.0 per cent; mononuclears, small, 25.5 per cent; mononuclears, large, and transitionals, 12.5 per cent. The urine showed no abnormality and the Wassermann test was negative. Roentgenograms of the teeth showed that the upper left cuspid (Fig. 4 *b*) and lower left second bicuspid were pulpless, had a poor canal filling and some bone absorption at the root tip. The lower left lateral incisor was a peg tooth. The root was poorly filled and there was a large alveolar abscess. The three pulpless teeth were extracted. The brain-agar cultures showed no growth from the lower left lateral incisor, and only a few colonies from the lower left second bicuspid. The culture of the upper left cuspid showed an infinity of colonies of a nonhemolytic streptococcus (Fig. 5 *a* and *c*.)

Animal Inoculations.—March 1, 1922, two rabbits were injected with the broth culture from the upper left cuspid. One developed numerous patches of choroidoretinitis, and died, three weeks later. The necropsy findings were ascites and very large white kidneys. The other animal developed an exudate in the anterior chamber and corneal opacities of both eyes, twenty-four hours after inoculation. The following day the eyeballs were extremely red (Fig. 6 *a*). The right iris was discolored all the way around and the left partly around with milkish gray exudate (Fig. 6 *b*). There were grayish deposits on the cornea. The animal was killed. The necropsy was negative except for the eye findings. The streptococcus was recovered by smear and culture from both eyes. March 5, two more rabbits were inoculated with the streptococcus recovered from the left eye of the preceding rabbit. One developed circumcorneal injection and a choroidoretinitis, and died thirteen days later. Necropsy revealed only kidney abscesses. The other animal developed a marked injection of both eyes, and died within twenty-four hours. A short chain streptococcus was recovered from the eye. Two rabbits injected with this culture died in a few hours without showing any localized lesions. Two rabbits injected with the culture from the right eye of one of the second pair of rabbits developed patches of choroidoretinitis, and were killed six weeks later. The other animal developed no lesions.

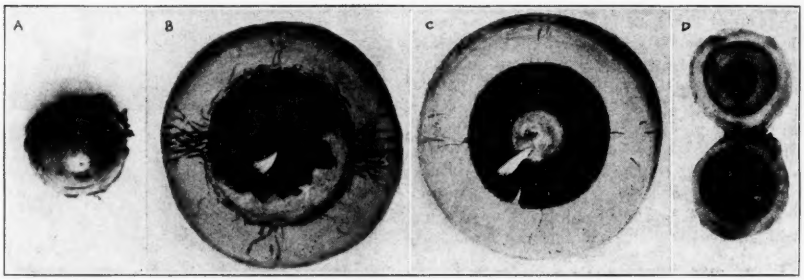

Fig. 6.—Eye lesions in rabbits produced by the intravenous injection of organisms from the teeth of the patient in Case 4, who was suffering from hyalitis. *A*, appearance of eye following the injection of the original culture. *B*, eye of second rabbit injected with the original culture. *C*, eye of rabbit with complete loss of vision due to a hyalitis following the intravenous injection of the attenuated culture. The loss of light reflex may be noted. *D*, eyes of rabbit injected one year later with the culture from another tooth of the same patient.

Three weeks after the original apical

cultures had been made, organisms were removed from the agar tube (Fig. 5 *a*) with a sterile pipet, grown in broth for twenty-four hours and injected into three rabbits. One developed a cloudy vitreous humor and died four days after inoculation. Necropsy revealed arthritis. The second animal showed a pericorneal injection, three days after inoculation. The iritis gradually cleared. The vitreous humor of the right eye became increasingly hazy. The red reflex was lost entirely, and there was little pupillary light reflex (Fig. 6 *c* and 7 *b*). The animal died eight days after inoculation. Necropsy was negative except for the eye findings. The patient's vision at the present time is 15/100.

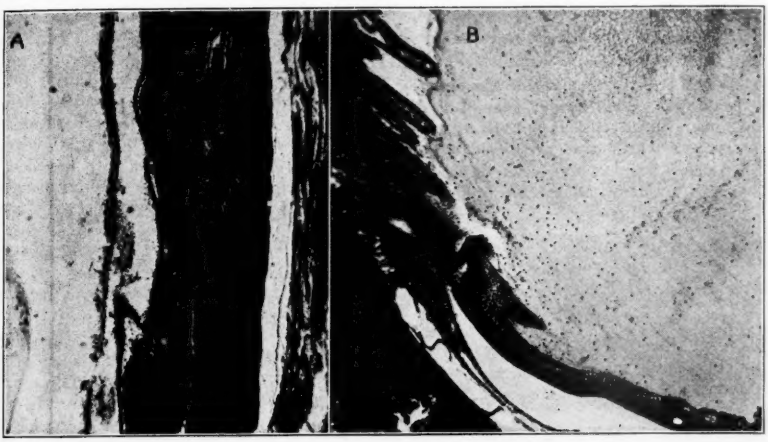

Fig. 7.—*A*, photomicrograph of eye shown in Figure 6 *A*. The cellular infiltration in the choroid may be noted. *B*, photomicrograph of eye shown in Figure 6 *C*. The cellular infiltration in the vitreous humor may be noted.

CASE 5.—*Acute Pyelonephritis. History.*—W. W., a medical student, aged 34, stated that two weeks previously he had

Fig. 8.—Bicuspid tooth of patient in Case 5, who was suffering from an acute pyelonephritis. The tooth was negative in the roentgenogram, yet from the root tip a profuse growth of streptococci was obtained.

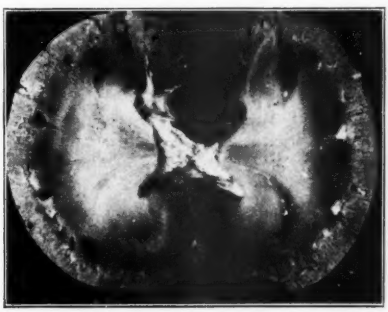

Fig. 9.—Kidney of rabbit following the intravenous injection of culture from tooth shown in Figure 8. The abscesses in the medulla may be noted.

suffered from frequent burning urination, hematuria, chills and fever as high as 102F. The symptoms improved at first under medication, but the chills and fever recurred. He had had a similar attack, nine years previously. There had been no other illness. The tonsils were cleanly removed.

Examination.—The physical examination was negative. The urine showed gross blood, many pus cells and a short chain streptococcus, which was recovered by culture. One bicuspid tooth (Fig. 8 *a*) held a large inlay under which the pulp had

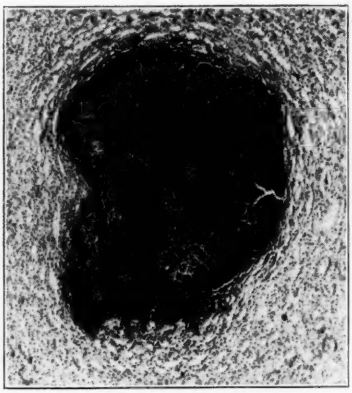

Fig. 10.—Photomicrograph of lesion in medulla of kidney shown in Figure 9.

died. There was no area of rarefaction at the tip. The tooth was extracted. From the tip a pure culture of a green-producing streptococcus (*Streptococcus fecalis*) was obtained.

Animal Inoculations.—Two rabbits were injected with the culture of the streptococcus. One showed at necropsy multiple abscesses in the pyramids and a purulent arthritis (Fig. 8 *b*). The other showed an acute hemorrhagic nephritis and a few endocardial vegetations. The urine became normal, and there have been no further symptoms.

CASE 6.—*Duodenal Ulcer. History.*—H. A. A., a business man, aged 44, had several gastric hemorrhages in December, 1922. For six months previous to this, he had had indigestion, consisting principally of a feeling of fulness after eating. A diagnosis of duodenal ulcer was made. Several teeth were extracted at this time. There were no further hemorrhages, and the symptoms were largely relieved, although the patient stated that he still had indigestion at times, for which he took soda.

Roentgenograms taken in June, 1924, showed one tooth of questionable vitality and one pulpless tooth with little roentgenographic evidence of infection. At the site of extraction of the upper left first bicuspid and first molar, some filling material remained, and the surrounding bone showed evidence of infection (Fig. 9 *c*). The two teeth were extracted and the infected bone curetted. Cultures in deep tubes of glucose-brain-agar showed a short chain streptococcus in all.

Animal Inoculations.—Two rabbits were inoculated with the mixed broth cultures. One rabbit was dead the following morning and showed many hemorrhages in the duodenum. The second rabbit was killed. This one showed also many hemorrhages in the first third of the duodenum without lesions elsewhere (Fig. 9 *a*). In order to determine whether the area of infected bone might play a part in the causation of the ulcer, one rabbit was injected with 5 c. c. of the broth culture from this area only. At necropsy, twenty-four hours later, the duodenum showed massive hemorrhages (Fig. 9 *b*). There were no other lesions.

CASE 7.—*Multiple Onychia. History.*—M. K., a housewife, aged 51, was first seen in regard to her present infection, Jan. 10, 1922. She gave no history of the acute infectious diseases of childhood. Until three years before, she had led an exceedingly active life on a farm. She had had palpitation of the heart and soreness in the chest for many years. At intervals during the last twenty-three years, she had had painful swellings of the larger joints. She had had nycturia two or three times, without pain on voiding.

Twelve years before, she began to have trouble with her finger nails. This consisted of swellings, redness and tenderness around the nail roots. At times, pus could be expressed. The nails of all the fingers were successively involved, as well as the nails of the great toe on the left foot. The infection usually ended with exfoliation of the nail. There was no history of injury

or of the use of irritating substances. The trouble had continued until five years before, when the patient was referred for dental treatment. Four teeth were found to have periapical abscesses and were extracted. One tooth, although pulpless, was negative roentgenographically, and was filled and allowed to remain. After the dental treatment, all the active nail lesions cleared up, as did the arthritis.

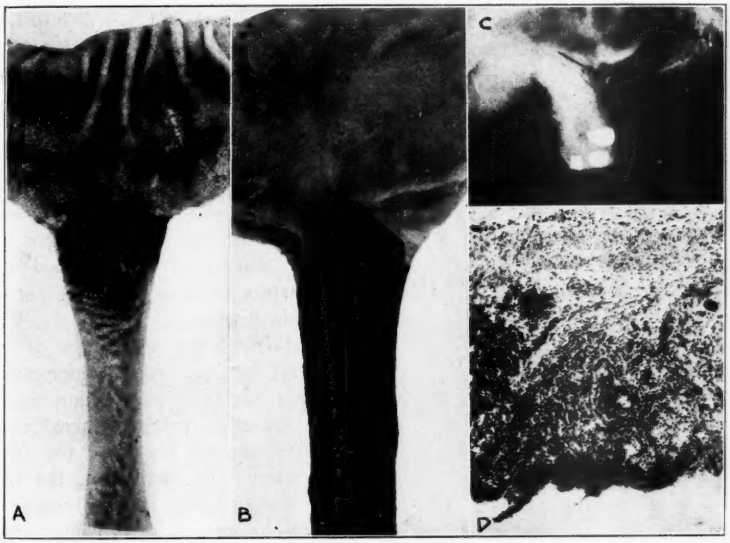

Fig. 11.—*A*, duodenum of rabbit injected with the mixed cultures from patient in Case 6, who had had a duodenal ulcer. The numerous hemorrhages in the duodenal bulb may be noted. *B*, duodenum of another rabbit following the injection of the culture from an area of infected bone only from the same patient. *C*, area of infected bone the culture from which produced the lesion shown in *B*. *D*, photomicrograph of the lesion shown in *A*.

Jan. 10, 1922, the patient returned because she had begun to have pain and redness around one finger nail. She was also having palpitation of the heart. She now had no joint symptoms.

Examination.—The middle finger of the left hand showed marked swelling and redness around the nail root. The nail was tender on pressure. No pus could be expressed. There was no glandular enlargement. The right tonsil was red and showed a few plugged crypts. The heart action was rapid; and the sounds were distinct with a tendency to gallop rhythm. The blood pressure was: systolic, 110; diastolic, 65.

A blood count showed 5,592,000 red blood cells, 4,950 white cells and 90 per cent hemoglobin (normal standard). A differential count of 500 cells showed: polymorphonuclear neutrophils, 58 per cent; eosinophils, 1 per cent; basophils, 0; large mononuclears, 7 per cent; and lymphocytes, 34 per cent. The Wassermann test was negative.

A roentgenogram of the teeth revealed areas of rarefaction around the roots of the lower right molar. All other teeth were vital. There was no pyorrhea.

Outcome.—The lower right second molar was extracted. The nail infection quickly subsided. A urine examination, six weeks later, showed no albumin or pus cells. The palpitation of the heart disappeared. The

patient was seen several months later. There had been no return of the nail infection.

Animal Inoculations.—A culture on blood-agar of the roots of the extracted tooth showed a profuse growth of *Streptococcus nonhemolyticus* 1 (Holman). January 13, one rabbit was injected intravenously with a broth culture of the organism. Four days later, a second injection was given. Eight days after the first injection, the animal was killed. The postmortem examination revealed hemorrhages in the lumbar muscles, a few small abscesses in the cortex of the kidneys and purulent fluid in the shoulder joints. The organism was recovered in pure culture from the joint fluid. Around the nail root of the second toe of the left fore foot, there was marked swelling and injection (Fig. 10 *a*).

Fig. 12.—Toe of rabbit injected with the culture from the tooth of patient in Case 7. The swelling of the toe is indicated by the arrow.

There was hemorrhage around the nail roots of the other toes of the same foot. The other toes were normal. A drawing of the section of the toe that revealed grossly the most marked change is shown in Figure 9 *b*. The nail was removed before the section was cut. The area of polymorphonuclear leukocyte infiltration is evident (Fig. 10 *c*).

The organism recovered from the joint of the first rabbit was injected into two others. These showed muscle hemorrhage, a purulent arthritis and abscesses of the kidney, but no involvement of the nails. The organism was carried through two more sets of rabbits, with similar results.

SUMMARY AND CONCLUSIONS

A very high percentage of teeth that are negative roentgenographically harbor infection. The roentgenogram should thus never be depended on to eliminate a tooth as a possible focus of systemic disease.

A fairly large percentage of teeth that are positive roentgenographically did not harbor any infection or sufficient infection to be a factor in systemic disease at the time the culture was taken. In such cases, the infection has probably run its course and become bacteria free, as happens in infections elsewhere in the body.

The periapical tissues of a certain percentage of pulpless teeth, either positive or negative roentgenographically, are sterile when cultured in glucose-brain broth. This does not prove that such are really sterile since some other method of culture might reveal organisms. The findings suggest, however, that a pulpless tooth is not necessarily infected.

The bacteria concerned in chronic foci are quite pathogenic as judged by their ability to produce lesions in animals on intravenous injection.

In selected cases, one can prove an

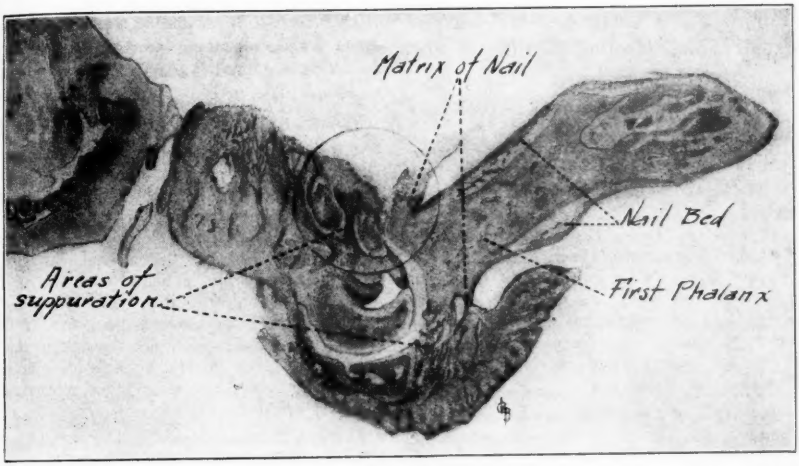

Fig. 13.—Section of toe indicated by arrow in Figure 12.

Fig. 14.—Photomicrograph of lesion around the base of nail. The area of polymorphonuclear infiltration is indicated by the arrow.

unmistakable tendency of bacteria from chronic foci to localize in certain parts of the body. These cases afford valuable experimental proof of a causal relation of a chronic focus to systemic disease.

DISCUSSION

Weston A. Price, Cleveland, Ohio: To start the questionnaire I will ask Dr. Haden two questions. In the culturing of teeth that have been extracted, do you feel you are pretty safe in concluding that by bathing them in iodin or alcohol or both the percentage that carried infection was reduced?

Dr. Haden: I think the answer to that is found in the results of the cultures of the vital teeth, and that is the crucial part of the entire study. In vital teeth, we get a small percentage of positive cultures, and it is only fair to conclude our percentage of contaminations would not be greater in pulpless than in vital teeth.

Dr. Price: In your chart, you show infections with ten colonies or more. Would you explain again why you have not counted those from one to ten?

Dr. Haden: A pathologic study of this kind should not be confused. One has to select a way of doing things, do them that way, and then record the findings. What we all are interested in is knowing something about the numbers of bacteria and trying to differentiate the teeth we think harbor enough bacteria to cause disease. To me, it seems a wise thing to differentiate the way indicated from our standpoint; that is, those that had ten or more colonies and those that had more than 100, because it gives a concrete idea of the extent of the infection.

B. S. Hert, Rochester, N. Y.: In the chart shown on the screen, the localization was reduced in percentage from the left hand side to the right hand side. The last two were on the eye, and stomach and duodenum. I understood they were incorrect. Why were they incorrect and the others correct?

Dr. Haden: I did not mean to say they were incorrect. These charts presented what we found.

Dr. Hert: There was 23 per cent to the eye and then something went up to 18, and I think the stomach and duodenum went up to 12 or 13.

Dr. Haden: I think you referred to the first chart, which included all animals injected. In that group, including all patients, the incidence of peptic ulcer was 13 per cent. The elective localization chart was made by dividing the big group into two groups, namely, the animals injected with cultures from patients who did not have peptic ulcer, and those injected with cultures from patients who were suffering from peptic ulcer. In the first group, only 7 per cent of the animals developed peptic ulcer; in the latter, 53 per cent were similarly affected.

Clifford Rudine, Salt Lake City, Utah: When a patient has a kidney lesion and, as far as physical examination is concerned, shows nothing else, and you discover an infected tooth and make an inoculation in the rabbit, does it show anything except the kidney infection?

Dr. Haden: Frequently such an injection will produce more than one lesion. Many of the animals, however, have only single lesions. In the case I showed you, the animals had no lesions except the kidney lesion. One thing that I think should be emphasized is the clinical study of the patients. One finds pus cells in the urine and other evidence of kidney trouble, when the patient does not complain of, or know that he has, a kidney infection. It is the rule to find more than one lesion in patients suffering from focal infection.

Dr. Price: It is sometimes as important to have the question asked as to have it answered for the reason that some workers, in making determinations as to whether or not localization has taken place, are reporting that only those cases show localization that show only one lesion—the one they are looking for. Let me illustrate: We inoculated thirty rabbits from the culture of the pulp of the tooth of a boy who was brought to us for rheumatism. He had definite joint lesions. His physician, or at least the nurse who brought him in, did not report and probably didn't know that he had heart trouble. Had we been looking for heart conditions only, we would have been able

to use, on this last basis, only two rabbits. Twenty-eight of the thirty developed heart lesions and two of the thirty developed joint lesions. Incidentally the boy was dead in a few months from endocarditis. Supposing we were making our determination on that case and threw out the twenty-eight cases of arthritis because they also had heart involvements, do you see how clearly we would be misinterpreting the facts in the case?

Dr. Rudine: Will that develop in the diagnosis?

Dr. Haden: The diagnostician should be very cautious in assuming that the patient has or will have lesions similar to those found in the inoculated animal.

S. W. Wherry, Ogden, Utah: Do you find, in inoculating through the tooth and injecting a rat or rabbit, that you get more heart lesions or kidney lesions than you do from the intravenous injection?

Dr. Haden: This cannot be done on rabbits and guinea-pigs, but has been done on dogs. I do not think enough work has been done to justify us in drawing any conclusions, except, to say that it has been shown that lesions such as these can be produced.

Dr. Price: Dr. Meisser gave a paper on that subject and he has the reports now on 100 dogs that were inoculated. He has produced lesions by inoculating the pulp chamber of the tooth, letting the dog carry the tooth for months and months, and he has a high percentage of localization. This other is also important and interesting. When he produced pulpless teeth in the dogs and they were healthy, the pulpless teeth did not become infected in a few months unless he infected some other tooth in the same dog. Then they always became infected.

Member: Isn't a 5 c.c. dose of pure culture an overdose for a rabbit weighing, say, 1,500 gm.?

Dr. Haden: That is a very fair dose. Dr. Rosenow has used up to 75 c.c., but we use only 5. This is a big dose—much more than a patient ever gets at one time, but I think it is a perfectly fair amount to use to get comparative data in the cases studied. Patients are receiving small doses over a long period of time instead of a single large dose such as is given the rabbit.

R. W. Bunting: The work in our school along this line has been done largely by Drs. Rickert and Lyons. However, I am much interested, and I know Dr. Rickert will be, in this statement of specific localization from typical cases that have occurred under Dr. Haden's observation. In an interjectory remark made concerning one of the early slides, he stated that he thought it possible, that such conditions might heal of themselves. I have wondered upon what he based his opinion and if he had any actual evidence that some of these cases of root-end infection, could be permanently cured especially those in which there is an incomplete filling and considerable space at the end of the root of the teeth for residual infection. Possibly, I misunderstood him.

Dr. Haden: I did make such a statement. I know little about dental tissue pathology, but I base the statement upon several facts. The area with granulated tissue, in itself, is evidence of a reparatory process on the part of the body. The obtaining of sterile cultures, and other well recognized facts concerning bone infection elsewhere in the body are added evidence. In chronic osteomyelitis, healing certainly takes place, even in the presence of a great deal of infection. This statement is true only of the low grade infections.

Dr. Bunting: I should like to have your opinion as to this particular point of view: In all other forms of osteomyelitis, the body defenses are able to reach the process; Dr. Price says that unless the body processes absorb all the portions of the tooth that are infected, they cannot reach the source, although residual infection in unfilled portions of the root end may become dormant, and may be hemmed in by the scar and granulation tissue. Whenever, as Dr. Price says, these protective forces decrease or whenever the organisms increase, there is a possibility that, at any time, these infections, living like cave-dwellers, may come out to attack the surrounding tissues. To me, it seems that root-end affections are different from other forms of osteomyelitis, and the only hope I can see is to treat pulpless teeth so that infection does not occur. I have no

hope or confidence in any tooth that has a residual infection that cannot be reached by medicaments or cannot be removed by surgical operation.

Dr. Price: To follow up your last point: Do you deem it possible to sterilize infected cementum while the tooth is in the mouth?

Dr. Bunting: I was not speaking of cementum because there are many infections in which the cementum is not seriously involved. If the cementum is extensively involved, I would either amputate or extract. But when the cementum is not involved, I have reason to believe, from the work of Dr. Rickert and from bacteriologic evidence, that such a tooth can be sterilized and can be made permanently stable as far as control of an infective process within the tooth is concerned. When this is done, the body has an opportunity to take care of whatever infective processes may be in the periapical tissues, unless there is a large amount of periodontal tissue involved, in which case it must be treated surgically, either by amputation or by curettage similar to the surgical treatment of pyorrhea. Such an area will never heal spontaneously any more than a pyorrhea pocket will heal unless there is surgical interference.

Dr. Price: How large an area would you consider too large?

Dr. Bunting: I cannot say. If it went over the convex surface at the end of the root of the tooth, I would want such a case in my own mouth treated surgically.

Dr. Haden: As regards the point Dr. Bunting brings up, I do not believe there is any data published that covers this point. What we need is more work and more conscientiously prepared data. I have no far-reaching conclusions to draw. I have simply attempted to present the results of the work that has been done up to the present time.

S. H. Brock, Dallas, Texas: With a reconstruction of the bone tissue after the granuloma, say, four, five or six months after the cast, is the reconstruction bone tissue still infected?

Dr. Price: I will answer that by asking you the explanation of this case: I will show you by the slide here a tooth that in April, 1923, was painfully abscessed. A woman developed the influenza. The tooth ceased to be sore. The record I made a year later showed the bone filled in, and the tooth became seriously infected. The woman had a nervous breakdown. My answer is that the filling in of bone around the root of a tooth is one of the most misleading and uncertain pathologic conditions with which we have to deal. In the second place, I have drilled for one-fourth inch into such conditions that had the area for several years, in a tooth which I had filled a number of years before. After this filled in and the bones became dense right down on the tooth, the woman was in bed with arthritis. I sent for her and took out the tooth and took cultures from the bone, one-eighth and one-quarter inch in three directions, and got the same stress. So my judgment is, from that and many other cases, that such bone may be infected.

THE SEQUELAE OF TRAUMATIC OCCLUSION

By W. H. SCHERER, D.D.S., Houston, Texas

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

THE recent research work of Dr. Harold Keith Box,[1] in which he has given to dentistry a new disease, to be classified not only in dental pathology but in general pathology as well, is epoch making in the field of periodontal research. To this disease, he has given the name of rarefying pericementitis fibrosa.

A study of the bulletin containing his recent work, just published, leads to the conclusion that the primary etiologic factor in the evolution of rarefying pericementitis fibrosa is a mechanical irritant acting on the entire pericementum, modified in its manifestations in many cases by systemic factors still to be analyzed. It is evident that traumatic occlusion, in the majority of cases, is a primary localizing factor and that systemic factors follow traumatic occlusion, modifying the clinical picture of the lesion.

He states furthermore that undoubtedly the best way to prevent fibrosa of the cementum is by so adjusting the occlusion that the stress to which each tooth is subjected will be within the normal range for the supporting tissues of that tooth. Such a relation he calls physiologic occlusion. Traumatic occlusion, a comparatively new subject, is being generally recognized as the greatest primary factor in the etiology of periodontoclasia (pyorrhea).

There has been a difference of opinion in the past, the profession having been divided as to the extent traumatic occlusion enters into dental periodontoclasia as a primary etiologic factor. Those who argued against it contended that traumatic occlusion developed as a result of a malocclusion, abnormal tooth forms, improper feeding in infancy, loss of teeth, etc. This hairsplitting evaded admission of the fact that an occlusal trauma had existed from the time these teeth were erupted or shortly thereafter. This difference of opinion may also have been due to the failure to recognize the early symptoms of traumatic occlusion. Careful clinical examinations, with the assistance of roentgenograms, will reveal the first signs of tissue reaction and the subsequent sequelae of this mechanical injurious agent.

Traumatic occlusion is a mechanical injurious agent whose effect is felt throughout the entire pericementum and the alveolar process, together with

1. Stillman, P. R., and McCall, J. O.: An Appreciation of the Researches of Harold Keith Box, Oral Hygiene, August, 1924.

the circulatory, lymph and nervous systems of the part and occasionally the dental pulp.[2] When we consider the nature and locations of these tissues, the factors of resistance, bacterial and mechanical agencies, it can readily be seen that a long train of pathologic sequelae may develop from occlusal trauma. Anything that is capable of injuring the periodontal tissues may produce in them the phenomena of inflammation.[3] The reaction of the tissues to any injurious agent and to the injury produced by it differs according to the nature of that agent and to the severity of the injury. The function of that reaction is to eliminate the noxious agent, to counteract its action and to repair the injury.

Mallory[4] states that the reaction may be evidenced chemically by metabolic changes, such as an alteration of secretion and excretion; morphologically by the presence of serum, fibrin and leukocytes and by the proliferation of cells, and physiologically by the alteration of functional activity.

The morphologic changes which take place as a result of the action of the injurious agents vary greatly according to the strength of the latter. These injurious agents were divided into two groups, the strong and the mild irritants. The reaction of the tissues to the mild injurious agents, from a histopathologic point of view, is of equal importance to the reaction to strong irritants, manifested in acute inflammation. Its significance in dental pathology has not been fully appreciated. The mild injurious agents include micro-organisms that produce weak toxins, and also strong toxins from different sources that have been so diluted as to act as mild irritants. From the standpoint of focal infections, which is the greatest problem in the dental profession today, and from our present point of view as well, the inflammatory reaction to these mild irritants is of much greater moment than the reaction to strong injurious agents.

According to Mallory,[4] the pathology of the inflammatory reaction to mild irritants consists of an exudation, and proliferation of endothelial leukocytes may be added, serum, lymphocytes, polymorphonuclear leukocytes and, rarely, eosinophils. Other injurious agents attract lymphocytes in large numbers, so that focal accumulations of some size may occur in various organs and tissues, for instance, heart, kidney, suprarenal and skin.

It must be kept in mind that bacterial invasion of the gingivae rarely takes place, without a preexisting state of lowered local resistance. Careful investigations have proved that, from a bacterial standpoint, the causative factors of these infections are common to all mouths. All factors in the disturbance of capillary circulation can be regarded as productive of lowered resistance, occlusal trauma, accumulations of foreign material, restorative impingements, food impactions, incorrect mouth hygiene, etc.

During a period in which the alveolar crest may be under great strain in its effort to maintain a balance of the forces acting against it, as in trau-

2. Stillman, P. R.: Traumatic Occlusion, J.A.D.A., 11: 585 (July) 1924.

3. Box, H. K.: Studies in Periodontal Pathology, 1924, p. 23.

4. Mallory: Studies in Periodonal Pathology, 1924, p. 23.

matic occlusion, the marginal gingivae, in many instances, presents, clinically, a characteristic hyperemia. This is to be regarded as a sign of pericemental trauma. On establishment of equilibrium of these forces by adjustment of mechanical factors, which to a considerable degree are under the control of the operator, these tissues, as a rule, quickly regain their normal tone and color. When the tooth is pushed against the alveolar wall and crest, an abnormal condensation of pericemental tissues lying between the tooth and these areas takes place. Dependent on the intensity of this condensation, the blood vessels are more or less constricted, the flow of blood through them is partly cut off and there is a dilation of the blood vessels. This condition is reflected in the terminal capillary loops in the marginal gingivae, a clinically observable disturbance.

The reaction of the tissues to occlusal trauma when it occurs in pulpless or infected teeth is more complicated and far-reaching in its systemic sequelae. We have, in this instance, the effects of this mechanical injurious agent operating in a periodontium whose resistance has already been lowered by the presence of pathogenic bacteria and their toxins.

It does not seem too great an assumption to consider pulpless teeth as analogous to other parts of the body that have lost their sensory and trophic nerve supply, and so are more liable to injury and more susceptible to infection. It would seem that there are just two factors that reduce the resistance of the apical regions of pulpless teeth to infection: (1) the ill-advised efforts to sterilize these regions by unduly drastic procedures, and (2) the replacement of the normal periapical tissues by more or less scar tissue and without adequate nerve supply.

Pulpless teeth in the presence of nearby infection are a decided menace and in the presence of more remote infection a hazard; that hazard depending, if one is inclined to accept the opinions of Rosenow, on the character of the distant infection and the selective affinity of the infecting organism for bone and periosteum.[5]

Pulpless teeth are perhaps more liable to excessive occlusal stress owing to the extensive restorations necessary after root-canal treatment. The tooth or its restoration may be in supra-occlusion. Under these circumstances, it receives the entire stress imposed by each contraction of the temporal and masseter muscles, until it has been forced into its alveolus to an extent that will permit the occlusal contact of the remaining teeth.

There is constant impact on a tooth that is infected or was never rendered sterile before filling, and the apical tissues are of low resistance, due to bacteria and their toxins. The conditions are perfect for the development of a dangerous focus of infection, the toxin to be carried into the system by the circulatory and lymphatic systems. While not adhering to the 100 per cent doctrine of removal of such teeth, we know that every apical infection is a potential menace at all times. If pulpless teeth are permitted to become traumatized by excessive stress, we are developing actual and definite foci of infection,

5. Hatton, E. H.: Focal Infection, J.A.D.A., 11: 618 (July) 1924.

which may have remained inert and innocuous.

Our present technic of crown and bridge construction and the types of attachments employed in bridgework are vastly superior to those used years ago.[6] In bridges and partial dentures, the tendency to traumatic occlusion is increased, for the reason that more occlusal surfaces are being restored and there is proportionately more opportunity for faulty occlusion. Some of this work is excellent, indicating thought in its planning and skill in its execution, but a close study of the occlusion reveals that, in a majority of these cases, while there may be normal occlusion in centric position, there is a prominent obstruction to occlusal range or entire lack of occlusion. There is usually more or less obstruction.

When incoordination exists in teeth held rigidly in one position by a bridge, splint or partial denture, either fixed or removable, pocket formation is more rapid than when the tooth has an opportunity to move in its socket and thereby partly accommodate the trauma. When these restorations are made, with pulpless teeth for abutments, which I believe to be a questionable practice, regardless of perfect root-canal surgery and negative roentgenograms, these teeth will not long remain innocuous, as foci of infection, under this excessive stress and constant impact.[7]

It is seldom that loss or impairment of function in the act of swallowing is considered in connection with traumatic occlusion. The normal act of swallowing is performed several hundred times daily. Each performance requires six seconds from conception to completion. Considerable positive force is applied in occluding the teeth in the normal act of swallowing. The function cannot be properly accomplished unless the teeth are in full occlusion. There is also a negative or sucking pressure. Under interference, this negative pressure will diminish almost to the vanishing point and the patient will have to be taught how to swallow again.

Any abnormal condition, such as tender or aching teeth, that interferes with either this positive or this negative pressure will interfere with the function of swallowing. The loss or impairment of the act of swallowing will result in atrophy of the muscles which enter into the function of the mandible.

The act of swallowing, according to Monson, should drain all parts of the mouth and the eustachian tubes. The cheeks and lips work in such a manner as to squeeze or force the contents of the vestibule or buccal or labial cavities through the interproximal spaces.

It appears that the act of swallowing is to keep the mouth clean by the negative pressure extended. When this function is interfered with, it is readily understood how conducive the condition would be for the increase of calcareous deposits, development of caries and the marked diminution of tone of the periodontal membrane.

Patients frequently complain of a

6. Smith, Tom: Traumatic Occlusion and Its Correction in the Treatment of Pyorrhea Alveolaris, J.A.D.A., 8: 971 (Dec.) 1921.

7. Monson, G. S.: Impaired function as a Result of Closed Bite, J.A.D.A., 8: 833 (Oct.) 1921.

condition of hypersensitiveness of the cervical portion of the tooth, or an increased reaction of the entire tooth to thermal changes. These cases are those that exhibit no caries, no hyperacidity of the secretions of the mouth, or any of the other causes of hypersensitiveness or hyperemia of the dental pulp. Applications of liquor formaldehydi and other desensitizers are used without appreciable effect and treatment must be given often.

Close examination of the occlusal surfaces in these cases reveals surface wear and facets. This sensitiveness, in most cases, can be relieved entirely by improvement of the occlusion.

More severe sensory reactions than the foregoing mild irritations are frequently met with. The patient may or may not be able to localize these pains, as they are sometimes of reflex origin, lancinating in their character and closely resembling tic. Roentgenograms of these teeth reveal little pathologic change. There may be a slight thickening of the pericementum and some calcific changes in the pulp chamber. Clinical examination will show that these teeth respond to thermal tests and are not sensitive to percussion, and that they have vital pulps. The occlusion is such as to have caused considerable surface wear and trauma.

These cases exhibit a high general resistance. The periodontal tissues are highly resistant to infection. The symptoms, which, in the general run of cases of average and low resistance would localize around the affected tooth, are, in these cases, referred as a reflex to the nerve trunk supplying the part.

In the interpretation of roentgenograms, we frequently find some periapical abnormality, which, to the uninitiated and careless observer, are interpreted as granuloma. This periapical abnormality, occurring on a tooth carrying a large inlay, immediately suggests to the operator a pathologic condition as a result of the inlay. Unless thermal tests and corroborative clinical examinations are made, these teeth are opened and pulps found vital and healthy. This abnormality or lesion is caused by a disturbance of the vascular system of the apical region, induced by constant trauma. It is usually found at the apices of teeth that have a strong alveolar support and that do not exhibit bone resorption and other disturbances in the region of the alveolar crest.

In chronic hypertrophic gingivitis, we have sensory reactions and abnormal bone development, due probably to irritants and trauma.

The hypertrophied tissue loses its inflammatory character and gradually becomes fibrous and thickened. The alveolar process shares in the thickening until finally, in severe cases, the whole of the marginal edge of the jaw may be thickened, with a gutter of bone projecting outward and downward from the alveolar process, and form a complete ridge on both lingual and buccal surfaces of the alveolus. There is no hemorrhage and usually no pain, but occasionally there is some discomfort in the teeth. Patients seek relief from diffuse neuralgic pains rather than the hypertrophic condition of the alveolus.

The presence of hypertrophy of both gingiva and underlying process around the margins of crowns, particularly those that have been pushed

well home, is quite common. In this condition, there is usually occlusal trauma, which is probably the causative factor.

Other examples of irritants would be serumal calculus, orthodontic appliances or any foreign material retained under the gingival margin.

The prevalence of occlusal trauma is greater than is generally supposed even by the periodontist who devotes his entire time to this specialty. It is not limited to its association with periodontoclasia, as we have noted previously. We have numerous manifestations of this mechanical force producing many types and variations of diseases.

I make this plea for more careful observation and diagnosis of the effects of this mechanical injury. Diagnosis of the advanced stages of all diseases is simple because of the obvious and extensive lesions. At this period, diagnosis has little practical application in dental practice, outside the specialties of oral surgery and exodontia. The recognition of the early symptoms in incipient disease is more difficult, and it is here that the dental profession may render a service within the field of preventive medicine that will be of inestimable value to humanity.

DISCUSSION

Julian Smith, Dallas, Texas: The subject of traumatic occlusion is occupying a more prominent place in the study of the etiology of periodontal disease than all other subjects combined. The recent discovery of Dr. Box in regard to the primary evidence of interference with function which he has entitled rarefying pericementitis fibrosa is the most important step in dental research that has been presented to the profession since, to quote Stillman, Miller's discovery of the relationship of carbohydrate fermentation to the production of caries. The early manifestation of this disease process is not accompanied by any of the sympoms by which we usually expect to recognize periodontal disturbances, the only visible sign being a slight mobility in the teeth, little more than normal. Referring to this disease Dr. Box says, "This is a chronic progressive lesion of the pericementum, which results in the rarefaction and destruction of alveolar bone, and consists of the formation, in the pericementum, of a new tissue, which, on the one hand, changes the normal arrangement of the pericemental structures, and, on the other, replaces the bone substance of the process." It changes the pericemental structure, and in a measure takes its place, and infiltrates into the adjacent bone, causing the rarefying effect that can be seen in the roentgenogram. The crest of the alveolus and associated osseous tissues show a radiolucence, and the pericementum a decided thickened appearance. Dr. Box attributes this early disintegration to traumatic occlusion, in these words: "There is sufficient clinical evidence to prove that rarefaction of the alveolar process is almost constantly associated with overfunctioning teeth and traumatic occlusion seems to serve as a main factor in the localization of this rarefying process." Dr. Box recognizes two distinct types of periodontal disease, which he designates as chronic periodontitis simplex and chronic periodontitis complex. The former is the type that is atrophic in its results, as when there is a general absorption or destruction of the alveolar structure with little other manifestation, little exudation and no pus, which we usually find about nonfunctioning teeth. The latter, and the one we usually are called on to treat, is what we commonly know as pyorrhea alveolaris. In his "Studies in Periodontal Pathology," Dr. Box describes the progress of this disease as the result of four different and distinct lesions, coalescing into the one complex condition of pyorrhea. First, we have the rarefying pericementitis fibrosa, acting as a pathfinder for the three other lesions. Next is chronic gingivitis, with incipient pocket formation in the gingival crevice; then chronic pericementitis, in which the pocket invades the pericementum and becomes continuous with it, and finally chronic osteitis, which completes the syndrome. After careful consideration of the progressive nature of this disease, as just described, we must con-

clude that if we clear up the first or initial factor, the rarefying pericementitis fibrosa, we materially decrease the chances for infective influences to become established. Accepting the theory that traumatic occlusion is the principal factor in establishing the rarefying process, and also that the correction of traumatic occlusion is, to a large degree, possible, does it not come within the field and, in fact, is it not the imperative duty of every general practitioner to study and practice the correction of occlusion, as his contribution to the science of preventive dentistry? As regards the mechanical correction of traumatic occlusion, there is much to learn, and few teachers. For an operator to undertake, blindly, without instruction, to grind the high points of occluding teeth to a perfect coordination of cusps, planes and angles, is to invite failure. Too much grinding, which is one of the most common results, is apt to bring about additional trauma, by superimposing and adding strain on some area heretofore unaffected; or it may possibly cause the affected area to become nonfunctioning. Traumatic occlusion cannot be corrected in one operation but should be overcome by several consecutive treatments, lightly touching the high points at each operation, and gradually bringing the occlusal surfaces into a relative coordination. No clinic should be considered complete in which the Clinician does not teach the correction of traumatic occlusion. The results of excessive occlusal stress vary with the character of resistance in the periodontium, according to Stillman. In the type of case in which the bone is adequate in bulk and texture to support excessive stress, there is little or no bone rarefaction, little or no mobility and little vascular disturbance in the gingiva and pericementum. In this type, there is sometimes a severe response in the more remote nerve trunks. Where the alveolar bone is not sufficiently resistant, we have bone rarefaction, absorption, mobility and vascular abnormality in gingiva and pericementum. There is little or no sensory pulp reaction and no remote nerve symptoms.[8] When patients have symptoms of pain, either local or remote, and there is no evidence of pulp disturbance, traumatic occlusion is most likely to prove the exciting factor. In regard to pulpless teeth, Dr. Scherer says, "Pulpless teeth, in the presence of nearby infection, are a decided menace, and in the presence of a more remote infection, a hazard." I want to stress what he has to say in regard to the added strain that these teeth are called upon to bear, when they are used as abutments for restorative work. The possibilities for excessive occlusal as well as lateral stress are greatly multiplied when two teeth are called on to bear the burden of the additional ones, and the greater occlusal surface offers many more opportunities for mechanical injury. The fact that they are tied together prevents the natural function of mobility, which means stimulation, without which they cannot receive proper nutriment. In pulpless teeth, this condition is aggravated by an already lowered local resistance, and in the case of trauma can readily become a source of infection. It is as essential that proper occlusion be maintained in bridged teeth as in the natural ones, and proper occlusion means not only that they must not overfunction but must coordinate, so that each bridge-tooth bears its proper share of resistance in mastication. Dr. Scherer has brought out so many points for consideration that it is impossible to take cognizance of them all, and I heartily commend their further study by the profession. I wish I might present at this time Dr. Stillman's theories in regard to stimulation and irritation, as applied to the effect of traumatic occlusion, but time forbids. It is aptly and interestingly described, with a number of convincing clinical experiences as well,[9] and I should advise everyone who has not read this article, to do so. It has a wealth of information on this subject and is presented in a most concise and attractive manner. I want to call attention to the twenty signs of early periodontal disease that Dr. Box has compiled, the most comprehensive diagnostic information that has ever been presented. Dr. Box has given to the science of dentistry the most important contribution of recent years, and best of all he promises us further developments. The profession at large is grateful to him.

C. S. Kramer, Woodman, Colo.: I want to ask Dr. Scherer three questions: 1. Did you ever see regeneration of bone around a pulpless tooth? 2. Did you ever get regeneration at the apical end of a tooth when the destruction was due to trauma? 3. Do

8. Goadby, Kenneth: Diseases of the Gums and Mucous Membrane, 1923, p. 31.

9. Stillman, P. R: Footnote 9, page 587.

you get resorption of an hypertrophied bone—an alveolar bone—after relieving trauma?

Benjamin Tishler, Boston, Mass.: I find locked occlusion much more common than it is supposed to be. It is nothing more or less than a whole or partial interference with the buccomandibular or incisal movement. The cusps of the teeth are usually very long, and one would say, often, that the teeth are in normal occlusion; but when the mandible is moved laterally, the cusps are not entirely freed, and as a consequence a locking results. In conjunction with this condition, I have found, in almost every case, that a faulty nervous habit has developed. I know a patient who after driving an automobile a long distance grinds his third molars until they are sore. In a young woman who had a slight nonocclusion from cuspid to cuspid, with traumatic occlusion in the molar region and a locking there, the posterior cusps of the lower first permanent molars were ground flat, and the mesial roots were exposed, showing that trauma was present over the posterior root. Usually, the incipient lesions of trauma are opposite the point of contact. The patient complained of a burning sensation, which extended from cuspid to cuspid. Hers was a beautiful mouth and well cared for. I freed the molar teeth and brought the incisors into occlusion. The burning sensation persisted, but at the end of a month, it had begun to disappear. I have not seen her for more than a year and a half, and the discomfort has not recurred. Traumatic occlusion will produce lesions as a result of hypertrophy, and nonocclusion will produce lesions through atrophy.

Olin Kirkland, Montgomery, Ala.: Stillman[10] has called attention to many interesting cases of obscure pain resulting from traumatic occlusion. About six months ago, I heard a patient of one of my associates discussing with him an obscure pain in the maxillary region that resembled the symptoms of tic douloureux. It was agreed that the patient consult a rhinologist, with the prospect of an alcoholic injection, or an operation on the second division of the fifth nerve for the relief of his pain, which had become unbearable. Having heard the patient say that the pain usually began when the jaws functioned in occlusal movements, I requested that he permit me to correct the occlusal stress. This was immediately accomplished, with pleasing results. He had lost the first maxillary molar, and the second and third molars had drifted into excessive occlusal disharmony, producing noticeable mobility during occlusal movements. The first treatment did not result in complete relief. On further investigation, I decided to grind the teeth involved to the extent of giving them almost complete occlusal rest. About six months have elapsed without any recurrence of pain.

L. P. Robertson, Marlin, Texas: May I ask Dr. Scherer whether he would recommend the automatic grinding of the teeth with carborundum powder?

Dr. Scherer (closing): I was glad to have Dr. Smith stress the necessity of not only the prosthodontist but also the general practitioner looking for signs of occlusal wear. It is surprising how many apparent details are overlooked by the general practitioner when the complete restoration of the mouth is indicated, and the teeth and their investing tissues are badly involved. I have been unfortunate in several cases in having to take charge of patients after they have had extensive restorations, and in several cases after beautiful porcelain jackets were installed. It seemed criminal to grind into the jackets, but it had to be done in order to correct the occlusion. It takes but a few moments to see if there is any surface wear and, if so, make an effort to correct it. We shall thus not only prolong the permanency of our work, but also protect the patient against the ravages of trauma and excessive stress with the resultant periodontal lesions. While spending some time, several years ago, with Dr. Bricker, I noticed that his patients returned at times for the correction of the occlusion on restorations that were made by a man who understood occlusion. He said that he accepted the responsibility for his work and requested that his patients report to him to see if there were any inequalities whatsoever of the occlusion. I think that this is a splendid practice. I

10. Stillman, P. R.: Varied Reactions to Injury Resulting from Traumatic Occlusion, J.A.D.A. 11: 585 (July) 1924.

agree with Dr. Tishler that these cases are most difficult to control and I believe we cannot grind these teeth in all cases so that the patient will have absolute relief. We have to strive for something like an ideal. We may have the complete removal of all the cusps from too much grinding. Regarding gritting of the teeth in sleep: patients who have excessive occlusal wear are given to that habit. They are nervous and when excited or under stress, they grit the teeth. As to the use of carborundum powder in the mouth, I do not think we have found a definite technic for correcting bad cases of occlusal stress. It is difficult to get the patient to bite in the same paths. Although we watch them closely and tell them the movements we want them to make, it is difficult to have them get the meaning and carry out instructions. We should have a method that is more mechanical. The use of models on anatomic articulators that simulate the movement of the mandible are a necessity, and no corrective work should be attempted without them. To depend on scraping a little off the model and then making the same correction in the mouth is difficult. I have used an abrasive paste on several occasions. Dr. Ward used to have such an abrasive paste. Patients may object to it, but I believe it will frequently assist in taking care of those little deviations if we can get their cooperation. Dry carborundum powder may be better. Dr. Kramer's first question was as to the regeneration around a pulpless tooth. I do not believe that I have ever seen it. The second question was "Did you ever get regeneration at the apical end in cases in which you thought the cause of rarefaction was trauma, the tooth having a vital pulp?" I have never seen any rarefaction at the apical end of a vital tooth. We get regeneration if we relieve the trauma. The third question was "Do you get resorption of hypertrophied bone after relieving the trauma?" I believe that it would be such a negligible amount as to be hardly noticeable. The deformity would, I think, be permanent. Regarding trauma, I made the statement several times and still contend that if there is any step of the treatment that is liable to be neglected in periodontal disease, we can better neglect perhaps everything else rather than the correction of the occlusion.

A STUDY OF THE HUMAN COMPLEXION AND A MEANS OF DETERMINING HUES AND SHADES IN EDENTULOUS CASES

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WHEN one arrives at that stage in life when he must anticipate wearing artificial dentures, there are two considerations that vitally interest him: "Can I use them?" and "Will they look well?" The first of these considerations has received a goodly share of attention in recent years, with the result that much progress has been made in technical procedure; but the second factor, it seems, has not received the attention it should have from the profession at large, and it is to this phase of denture service that these pages are devoted.

It is intended to offer a definite classification of the complexion and a similar classification of artificial teeth, for the purpose of facilitating the selection of harmonious hues and shades of teeth for edentulous cases.

It may be well to state in the beginning that, when I speak of hues, I refer to basic coloring, and, when I speak of shades, I refer to the various saturations of a hue. For example, shades 7, 9, 16 and 20 on the Twentieth Century ring, are all yellow, the hue or basic color is the same, but they are of different shades or saturations; that is, the depth of yellow varies; hence the various numbers.

The earliest, and perhaps the only, attempt at offering a definite system for the selection of teeth was a very elaborate one based upon human temperaments and known as the temperamental theory.

This theory is an attempt to classify mankind according to physical characteristics, and, as Turner states it: "It has as its basis the relative proportion of his mechanical, nutritive and nervous systems, and the relative energy of the various functions of the body." The temperament of an individual is supposed to be determined by the predominating influence of one or the other of these systems just mentioned.

An individual with certain color of hair and eyes, certain muscular and osseous development and certain other characteristics, mental and physical, together with a preponderance of some of the physiologic systems, was supposed to have teeth of a certain size, shape and color.

The temperaments are four in number: bilious, sanguine, nervous and lymphatic. The accompanying table presents the characteristics of the bilious temperament, and one may judge the impracticability of attempting to utilize these physical factors for the purpose of selecting harmonious tooth colors.

A further attempt to simplify the practical application of this theory was the presumption that one may possess some characteristics of one temperament and some of another, forming a binary temperament, such as biliolymphatic or lymphaticobilious, the name depending on which of these primary temperaments predominated; and teeth of a given

CHARACTERISTICS OF BILIOUS TEMPERAMENT

Basis	Stature and Osseous Development	Muscular Development	Contour	Circulation	Face and Features	Skin and Complexion	Hair and Eyes
Predominating organ is the liver which influences the whole body	Medium or tall; angular and rugged with rough articulations and large extremities	Strongly defined; cordlike and hard, the movements slow and deliberate	Angular and ruggedged; massive and ungraceful	The heart slow, the venous circulation predominating over the arterial	Harsh and angular; severely expressive	Skin coarse and dry; complexion tawny, olive or dull	Coarse, dark and abundant hair; black or brown, and small or piercing eyes

character were supposed to be found in the mouth of such an individual.

There was perhaps a time before races migrated beyond their isothermal bounds and mixed with other races when human beings were so constituted that these characteristics could all be associated in one individual, but, in this age, the temperamental theory, as such, has absolutely no practical value in the selection of teeth from a standpoint of size, shape or color. Therefore, the temperaments are eliminated as a factor. However, a study of these temperaments has led me to further investigations that have proved fruitful. Confronted by the task of selecting teeth in a vague and unsatisfactory manner for the edentulous patients that came to me, I determined, some years ago, to evolve a definite plan, if possible, which would be not only usable but also teachable. I began by keeping a tabulated record of all edentulous persons for whom I constructed dentures, covering every physical characteristic as outlined by the temperamental theory as follows: stature, osseous development, muscular development, contour, face and features, age, weight, complexion, color of hair, eyes, etc. And when the time came for selecting the teeth I did so, doing the best I could according to my own vague judgment. This investigation was conducted mainly to the end of determining the factors involved in selecting hues and shades, as we *had* the more or less workable theory of Leon Williams pertaining to face forms and tooth forms, and because also, from a standpoint of pleasing esthetics, hues and shades are by far more important than tooth forms, presuming, of course, that some degree of judgment has been used in selecting the size and form of teeth.

After recording the data as stated above, the results from a standpoint of color, when the cases were finished, were carefully and critically observed and tabulated on the record card. Inharmonious results were recorded as freely as pleasing results. This procedure was continued until 100 cases were tabulated. Simultaneously with this work, I was tabulating 100 cases with natural teeth, carefully observing and recording the shade of the teeth together with the physical characteristics, particularly the character of complexion and age of the patient.

Through a concentrated study of these records and observation of cases, it was soon revealed that osseous and muscular development, and stature and contour of face and body, have absolutely nothing to do with harmonizing teeth, and that they could be eliminated from further consideration; further, that the color of hair and eyes has no direct bearing on harmony of teeth; which eliminated them from any but secondary consideration. These physical factors were eliminated because the same hues and shades of teeth harmonized and lacked harmony in all varying mixtures of these characteristics to the extent that absolutely no rule could be established.

But there must be some rule to follow, some factor that will guide us definitely in the selection of teeth. Personally, I

am thoroughly convinced that there are but two factors, in the final analysis, to which we should give any consideration in this work, and they are, primarily, the complexion, and, secondarily, the age of the patient.

A definite complexion invariably demands a definite hue if we would avoid a clash in our color scheme. And it only remains now for us to be able to designate or isolate a definite complexion and the hue of the tooth that harmonizes with it.

It is comparatively simple to classify the human complexion; in fact, it is a simpler task to distinguish the types of complexion than it is to recognize and distinguish the three typal forms of faces as laid down by Dr. Williams.

A consideration of the characteristics of the color of man affords an interesting study. From the ebony-hued native of Central Africa to the colorless Albino of our own and European countries, there are many hues and tints. This coloring in man is due to several conjoint factors, such as pigmentation, translucency of the epidermis, presence of fat in the subcutaneous connective tissue and vasculation, or the flow and proximity to the surface of blood in the face. Pigmentation, the most important factor, is due to pigment deposited in a layer of cells forming the inner layer of of the epidermis. The number of these cells and their proximity to one another, and the quantity and character of the pigment deposited, vary in different people, the quantity being greater in dark skinned people and less in white people.

There are many conditions that exert an influence on the color of man, and it is difficult to determine as a positive fact the exact causes of the variations in hues, yet some general rules may be laid down that are fairly accurate and which are at least partially supported by facts. It has been suggested that at one time all the inhabitants of the earth were black or dark and that the present transition is from dark to light. The reason advanced in support of this theory is that, before the dawn of civilization, human beings were not clothed, their bodies being exposed at all times to the hot sun and beating elements; and experience has shown that a dark skin is the only one that can, for a great length of time, survive such an existence.

The hottest and coldest parts of the earth are inhabited by dark skinned people, such as the Laplanders and Eskimos of the frigid countries, and the negro, Hindu and other dark skinned people of the torrid zone; while the temperate zones for the most part are inhabited by people of lighter complexion. To bear this out further, we find the Scandinavian and Germans of Northern Europe fairer than the French and Austrians, and the French and Austrians fairer than the Spanish and Italians, and it is even a fact that the people of Northern Italy are fairer than those of the southern part, thus verifying the general rule that the color of man becomes darker as we near the equator and a hotter climate. But to attribute this altogether to the climate is a mistake; it is more a matter of civilization, or rather the manner of living. Even in our own climate if we were to live with our bodies exposed to the elements over a period of centuries, we would, without doubt, be a dark skinned people, because a colored skin is absolutely essential to resistance of the parching effect of the elements. The pigment of a dark skin provided a natural resistance and protection that enabled men to live in every clime during the uncivilized ages, where white men could not possibly have existed for a great length of time exposed to the elements. But with the advent and advancement of civilization, when men learned to build shelters and protect their bodies with skins of the forest and other forms of clothing, the complexion became lighter until, after centuries of greater or less civilization, fair skinned people now inhabit every quarter of the

globe and retain their fair skin by protecting it. In India, where the greatest opportunity for studying the color of man is afforded, two distinct civilizations exist side by side. The Priests, the Brahmans and the higher order of business and professional people, who live a civilized life, are fast becoming a fair skinned people, and no doubt will ultimately become fused and blended with the other white races of the world; while the poorer working people who toil daily with their bodies exposed to the elements are still a dark people and will remain so until their methods of living are changed. Thus, we see it is not, as claimed by some, the hot climate that causes the black skin, but rather the kind of life that is encouraged by a hot climate. And so it is through civilization and the knowledge and need of protecting ourselves from the weather that fair skinned people inhabit this land today, and become our edentulous patients.

The study and classification of the human complexion forming the basis for this paper applies only to those people who become or are likely to become our patients.

The component colors that enter into our complexions are for the most part red, yellow, orange and blue, combined in such proportions as to give the preponderance of red, yellow or gray to the complexion.

While it is interesting to know the factors causing the color and the component hues entering into the complexion, of the most interest to us now, since we have established that it is the color of the complexion with which we must harmonize teeth, is what is the actual color that we see when we look at a person.

In studying the human complexion for distinct, visible colors, may types are found. In my earlier classifications, I listed such complexions as florid, pink, yellow, swarthy, olive and tawny, and even others forming distinct classes; but realizing that for teaching purposes, the classification should be simplified, a further study in the harmony of tooth hues and complexion was made, and it was learned that these various complexions could be grouped under two heads. Therefore, for convenience and accuracy in selecting hues, the following classification has been made: 1. The yellow group: (*a*) red, (*b*) pink and (*c*) creamy and deep yellow. 2. The gray group: (*a*) olive, (*b*) swarthy,(*c*) tawny and (*d*) brown.

In the yellow group, we find nearly all blondes; nearly all red haired people with their typical reddish complexions, and a great many people having dark or black hair and eyes. This is the group in which are placed all people in whose complexions red or yellow in any saturation predominates.

In the gray group are placed all people in whose complexion gray, brown or olive predominates. This group is composed, for the most part, of people with dark hair and eyes; but frequently blondes and red or brown haired people whose pigmentation has changed through the years are found in this group.

In this connection, it must be borne in mind that grief, fatigue, worry, disease and a season's exposure to the sun and wind changes the pigmentation, though only temporarily, and, in our study of the complexion, due consideration must be made for these conditions.

NATURAL TEETH

A classification of the colors of the human teeth is not so difficult nor so complex as a classification of complexions. We haven't the varying hues and shades that we find in the complexion, yet there are many direct component hues entering into the makeup of the color of the natural teeth. But speaking from a purely practical point of view, we are not interested, except in a passive way, in the various component colors that enter into either the color of the complexion or the color of the teeth; it is only that hue which reveals itself

to the eye when we observe teeth and people.

Of what interest is it to a woman with a brown dress to know that it requires red, yellow and blue in definite proportions to produce that brown? If she wishes to harmonize some other article of wearing apparel with the dress, she is interested only in the color as it reveals itself to the eye, which is brown. So it is with us in the study of complexions and teeth. We must harmonize one with the other; and when we know the color of the complexion, we know we can take some saturation of the same color and produce harmony. The deeper we go into the study of art and color combinations, the more bewildered we become in trying to arrive at a definite scheme.

Did the question of why we have coloring matter in the human teeth ever occur to you? We know that the animals of the jungle are colored in various ways for a definite purpose. We know that the fishes of the sea and the fowls of the air are colored also for a definite purpose, that of protection from their enemies. The characteristic coloring of these animals is to serve as a camouflage, making their coloring similar to that of the haunts in which they have their abode.

We have proved also that the coloring in the skin of human beings has its definite purpose, which is also for protection against an enemy, not an enemy of the forest, but of the elements, such as the sun and wind. The coloring of man is a definite protection against these things, and just in proportion as man lives exposed to these elements, just to that extent must his skin be colored. But what can be the need of coloring matter in the teeth? They are not exposed to the elements, nor can we say the coloring is essential for the preservation or well-being of the teeth. Did it ever occur to you that one of Nature's great schemes is symmetry and harmony, in color as well as form? The well formed, rounded, upright body of a human being is by direct design of Nature for the purpose of beauty and symmetry. Could it be that it was the design of Nature in coloring teeth that they might harmonize in shading with their surroundings, that a pleasing aspect might be presented to the eye?

This is not an established fact, only an hypothesis. This idea could be substantiated in many ways, yet one premise would seem to refute this hypothesis, and that is that the teeth, in their coloration, are of a different character from the complexion in its coloration. The teeth do not vary as the complexion does; the color of the teeth is not so delicate as the color of the complexion; it is not so affected by influences that affect the complexion; and if the teeth were designed in color to harmonize with a certain color of complexion, provision was not made by Nature to change the color of the teeth to maintain and perpetuate that harmony as the complexion changed. Yet, since, in my opinion, the blonde type is that type of complexion from which all other types are variations, and since we find that the coloring of that type is a faint yellow, ranging between yellow and orange, and since we find that the color of nearly all human teeth is of that same hue, and consequently harmonizes with that type of complexion, I am inclined to believe that the theory just expressed, that the purpose of the color in teeth is to produce harmony in the makeup of the human countenance, is true. But whether it is true or not, we know that the color in teeth plays an important function in the harmony of facial conditions. Surely you will admit that the soft and delicate creamy yellow cast of natural teeth is far more harmonious than black teeth, absorbing all the rays of light or pure white teeth, reflecting all the rays, which undoubtedly would appear more or less ghastly in contrast with the types of complexion we have to deal with today.

In Nature, the color of the teeth often

clashes with the color of the complexion, owing to the fact that so many factors of living and of occupation and of diet and of mental attitude have exerted their influences over the hundreds of years of time, producing types of complexions of a nature entirely different from the basic blonde type, while the same factors have not influenced the color of the teeth. Consequently, the disharmony, which was not in the beginning taken into consideration by Nature.

The source of coloration in the teeth is of an entirely different nature from that of the skin. There are no definite pigment cells in the teeth, but, on the other hand, the color in the teeth, which is confined to the organic matter of the dentin is supposed to be an integral part of the structure of the teeth as is the color of blood, bile and internal organs. It is argued by some that the color in teeth is purely incidental as is the color of internal organs owing to the presence of some chemical element that is characteristic of the component substance.

An examination of the coloring matter of the teeth was carefully made by, and at the instance of Dr. Forest H. Orton,[1] and it was found invariably that the color reflected was a very faint yellow, between orange and yellow, which we, for the lack of a better terminology, have designated as a yellow. There being no color in the enamel and the enamel being thinner at the neck of the tooth and thicker toward the incisal edge, we find that the depth of coloration is greater at the neck of the tooth, showing at times a definite predominance of yellow blended into a slight grayish tint at the incisal edge due to the dilution of white. This, the normal and natural coloration of teeth, is characterized by a deepening or increased saturation with age.

Thus, we find that the coloration from a very faint creamy yellow to a yellow of deeper saturation is the predominating hue of natural teeth, and rarely ever do we find a variation from this rule except where various external factors have influenced the coloration. Devitalization, fillings, neglect and other factors may cause a darkening or a grayish or chalky appearance of the teeth.

ARTIFICIAL TEETH

Within the last few years, some manufacturers have endeavored to give us natural appearing artificial teeth, and to some extent they have succeeded. In conjunction with some men of the profession, they have made a study of the characteristic coloring in natural teeth and of the influences that affect this coloring as we visualize it. Some mistakes have been made, and artificial teeth have been colored as no natural teeth ever were, owing to the fact that certain color phenomena of teeth in the mouth were mistaken for a characteristic coloring in the tooth itself.

In the study of coloring in artificial teeth as they are presented to us, we find that in some there is a bluish cast, and in others a trace of green. It is doubtful that either blue or green is ever found as distinct coloring in natural teeth. A greenish or bluish tint often reflected from natural teeth is due to a background of the oral cavity, but no effort should be made in the manufacture of artificial teeth to incorporate these characteristics.

The manufacturers and members of the profession in joint investigation have learned that the color of teeth in natural states is not all of the same shade or saturation in the same set. However, as a general rule, they are of the same basic hue. The central incisors are the brightest teeth in the denture, while the saturation becomes greater with the lateral incisors, cuspids and posteriorly. Also, we have learned that an absolutely smooth surface tooth does not give the most pleasing effect to the eye since the re-

1. Orton, F. H.: Crown and Bridgework from a New Point of View, J.A.D.A., 8: 307, (Sept.) 1921.

flection from such a surface is entirely too bright. On the other hand, the reflection and refraction from a roughened or striated surface, either in natural or artificial teeth, is far more pleasing. Formerly, the coloring throughout the length and breadth of each individual artificial tooth and in all of the teeth of the set was the same, but the study of these things brought about a more pleasing situation resulting in the proper distribution of the coloring in each individual tooth, the greater saturation at the neck, and the shade blending to a lighter and often a slight grayish tint toward the incisal edge. The coloring of artificial teeth is not at all times identical with that of a natural tooth, since the materials which the manufacturers have to color the teeth is not the same as that coloring agent which Nature uses in human teeth; and while there is still a great deal of room for improvement in artificial tooth coloration from a standpoint of partial restorations, for full restorations the product as it is offered to the profession today seems to be fairly satisfactory.

Since we have established a classification of complexions, we shall attempt to classify artificial teeth accordingly. We find in the hue guide as it is presented to us for the selection of hues and shades, among others, various saturations of yellow and various saturations of gray. It is these hues and shades that we make use of in establishing a definite rule to follow in this work. For those complexions with a predominance of red, pink or creamy or deep yellow, in other words those of the yellow group, we use an artificial tooth of the same characteristic coloring, and with those complexions wherein gray and brown predominate, we likewise use artificial teeth of the same characteristic coloring.

Taking the hue guide and studying it under the most favorable conditions of light, I have been able to isolate those numbers on the guide that correspond to these distinct types of hue and shade: numbers 5, 7, 9, 14, 15, 16, 20, 21 and 25 exhibit decidedly the characteristic of creamy yellowness. Numbers 10, 11, 12, 13, 17, 18 and 19 exhibit an appreciable, and, in most instances, a predominating, degree of gray. All other numbers on the hue ring I have eliminated entirely from consideration in edentulous cases. For partial work, other numbers on the ring are sometimes useful. This includes the total number of saturations of the two hues found on the shade ring; but, for practical purposes, a number of these shades may be eliminated. In the yellow group, we may eliminate numbers 7, 14 and 25. In the gray group, I should suggest eliminating 12, 17 and 18, thus limiting the operator to a few numbers and thereby simplifying the procedure.

In selecting a hue and shade for an individual whose complexion can be classified in Group 1, we have six numbers on the shade ring from which we may make a selection, and in no one of these six numbers would you produce a clash in the coloring between the complexion and the teeth. That classification places us in a much more favorable position and very greatly reduces our chances of producing disharmony. Now, from among these six numbers on the hue ring, judgment may be used as to the degree of saturation most appropriate to the particular case at hand. Those persons exhibiting a very fair complexion and whose age still ranges around the thirties may naturally be expected to require less saturation in the coloring than those persons with more yellow in the complexion and of more advanced age. The same ruling, of course, would hold true in determining the saturation for members of the gray group; and, while in this group there is still not much likelihood of producing a clash in the coloring, perhaps a little more judgment may be required to determine the most harmonizing saturation for a given case.

It is not the intention to hold that all

difficulty in determining proper hues and shades has been removed, but it is claimed that the process has been made far more simple by grouping complexions and artificial teeth in similar classes. Neither is it expected that there will be full agreement on numbers from the shade ring as I have selected them, since the appreciation of color is largely a matter of personal equation. Some may choose to mix shades for the same individual, which is also another phase of the personal equation; but the purpose and intent of this paper is to lay down a basic principle as the foundation for selecting the proper color of teeth.

There are complexions that will require some thought and study and a close examination to determine in which class they should be placed, but as a general rule the classification is a simple and quick procedure.

An examination of the complexion should be made under the most favorable light conditions. It should never be made in the bright sunlight, nor under artificial light, but only in the soft light of a clear day, and preferably between the hours of 10 and 3.

SUMMARY

1. The temperaments have been eliminated as factors in selecting teeth.
2. The complexion is practically the sole factor.
3. We find that, while there are many distinct types of complexion in the Caucasian race, for the purpose of selecting harmonious tooth hues and shades we are able to classify these types into two groups: the yellow group and the gray group; and that most of the time at sight, and always with a little study, we can place every member of the Caucasian race into one or the other of these groups.
4. We find that, for the greatest degree of harmony, all the members of either of these groups require teeth with the same character of coloring.
5. We find that nearly all natural teeth are of the same hue, yellow, but of varying saturations, ranging from a very faint cream to a deep yellow, and sometimes with a grayish tip due to translucency.
6. We find that the color of one's natural teeth and his complexion often clash; and since the natural teeth are of a type to harmonize with blondes, it would seem to sustain the idea that the blonde is the basic type from which all others are variations.
7. Exposing a race of fair skinned people to the effects of the elements in any climate will, through centuries of time, produce a dark skinned people; and the reverse of this is also true.
8. We are able, from the samples supplied us by manufacturers, to isolate all those numbers that are distinctly yellow and all that are gray or grayish brown; which gives us a grouping or classification of artificial teeth identical with the complexion.
9. Nearly all blondes, red haired people, people with natural pink or rosy cheeks, except those with a decided olive complexion, and all those who have a definite flesh colored or creamy yellow complexion or red complexion, belong to the yellow group; and all those of swarthy, tawny, olive or grayish brown complexions belong to the gray group and require the designated hues and shades for color harmony.

THE RELATION OF PERIODONTOCLASIA, CALCIUM METABOLISM AND DIETARY AND SYSTEMIC DISEASE

By GRACE ROGERS SPALDING, D.D.S., F.A.A.P., Detroit, Michigan

(Read before the American Academy of Periodontology, Atlanta, Georgia, October 7-10, 1924)

IF there is any advantage in the frequent discussion of a subject, the dental profession has surely been much benefited by the persistent presentation at dental meetings of the topics, periodontoclasia, calcium metabolism and dietetics. That these themes are inexhaustible, there is no doubt; but in order to present to this group useful material, it was necessary to report herewith briefly the conclusions of others engaged in scientific research along these lines.

To consider the relation of subjects presupposes an understanding of them, but, if we completely understood any one of these assigned by our program committee, dental problems would be largely solved. Therefore, our discussion this evening must of necessity be superficial.

I would call attention to the works of one of our members, Dr. Weston A. Price, published in 1923, which reads:[1]

It is a most significant and lamentable fact that there has been practically no important progress in our understanding of the etiology of periodontoclasia, of the etiology of dental caries, or of the true relation of dental infections to systemic disease, except in the most general terms in a whole century, and this fundamentally, because the accepted doctrines had no basis in experimental pathology, but were a matter of inheritance from preceding generations, and were the logical assumptions.

From experiments and studies, Dr. Price draws the following general conclusions, some of which are of particular interest to periodontists:[2]

1. Dental caries is primarily a local expression of a systemic condition in combination with abnormal local physical conditions.

2. Periodontal infections, with periodontoclasia in the primary stages are fundamentally the expression of a vigorous reaction to local irritation, combined with a systemic exhaltation of the defensive mechanisms.

3. Calcium metabolism disturbances are fundamental factors in both dental caries and periodontal diseases.

4. Susceptibility or non-susceptibility to systemic involvement from dental infections, is fundamentally an inherent quality inherited or a matter of broken defense or both.

5. Dental infections are fundamentally chiefly an expression of the biologic qualities of the host, rather than of the invading organism.

6. So-called rheumatic group disturbances are in part symptoms of systemic sensitizations, an important factor in which is calcium metabolism disturbance.

7. Calcium disturbances are themselves secondary to the acid-base and toxin neutralization governing mechanisms, one of which is parathyroid functioning.

In short, Dr. Price believes that periodontoclasia, in the early stages, is an expression of a vigorous reaction to local irritants, (mechanical, chemical or bacterial) plus an exaltation of the defensive mechanisms of the body; also

1. Price, W. A.: Dental Infections, Oral and Systemic, Cleveland, Penton Publishing Company, p. 21.

2. Price, W. A.: Footnote 1, Vol. 2, p. 404.

that we are susceptible to systemic involvements from dental infections, unless we have inherited an inherent quality of defense that has not been broken by overload, this defense being in some way dependent on calcium metabolism and the mechanisms that control acid-base balance and toxin neutralization.

We shall endeavor to place a practical interpretation on these observations. Is it not possible that, owing to the stress which, in our early training, was laid on the saving of teeth, periodontists have been as responsible as the other much criticized members of our profession for saving some teeth that might better have been lost, since there is the danger of pulp involvement from periodontal lesions?

We do not fear the truth, and, if we have steered our activities in a slightly wrong direction, we can easily change our course if we find by searching for light that we have been out of the channel of the most complete service to our patients. Is it not conceivable that we may have stressed too much the exciting causes, while restricting the *significance* of the reaction, in the tissues, to those causes?

We cannot overestimate the value of the services of a skilled periodontist provided he does not underestimate the importance of underlying factors to periodontal lesions, which exert their influence in any disease.

Let us accept, for the sake of discussion, the conclusions of Dr. Price, since, without an equal armamentarium in the way of records, observations, experiments and experience in scientific research, we can neither verify nor disprove them. However, if this academy would but take the necessary steps for the keeping of accurate records, having in mind Dr. Price's classifications, an adequate amount of valuable information could be gathered, which would be of use in future investigations.

In recent years, we have been frequently reminded of the value of calcium in the human economy; that 85 per cent of the mineral matter of bones is calcium phosphate; that calcium salts are absolutely essential to the coagulation of blood, to the action of the heart, and muscle, and to the processes of digestion.

Sherman[3] informs us that the American dietary is more often deficient in calcium than in any other chemical element; that milling of refined flours removes more than one-half of the calcium; that green leafy vegetables and milk are excellent sources of calcium, and meat or white bread are not, and that much calcium is lost in the cooking of food. As you know, 99 per cent of the calcium of the body is in the bones and teeth, the remainder in the fluids and soft tissues. We learn too, from Sherman, that "a balance *must* be maintained between calcium on the one hand and sodium and potassium on the other;" also that "calcium seems to exert a favorable influence upon the economy of iron in metabolism, inasmuch as it appears to be possible to maintain equilibrium upon a smaller amount of iron when the food contains an abundance of calcium." Milk is an example of such food.

To select a single chemical factor in our complicated metabolic mechanism for discussion leaves a confused impression, since we can readily understand how it might influence and be influenced by other important chemical elements in the human organism.

Calcium metabolism (according to reliable authorities)[4] is influenced by "pregnancy, bacterial infection, glands of internal secretion, arteriosclerosis, certain foodstuffs, absence of vitamins and undernutrition." McCrudden states that: "The total calcium content of the bones,

3. Sherman: Chemistry of Food and Nutrition, p. 268.

4. McCrudden, in Barker, L. F., et al.: Endocrinology and Metabolism, New York, D. Appleton & Co., p. 752.

as well as the percentage of calcium in the bones, is normally subject to great variations from a variety of causes. Oxalic acid or oxalates in the food give rise to a negative calcium balance and may lead to osteomalacia."

He further says that, in 1881, the fact that a number of cows in a certain part of Germany, that had osteomalacia, were eating large quantities of beet tops led to an analysis of the beet tops, which showed they contained an abundance of oxalic acid. Experiments followed which proved that the presence of oxalic acid or oxalates in the food "leads to a negative calcium balance in rabbits, dogs, sheep and guinea-pigs, i. e., a decrease in the calcium content of the bones. Calcium oxalate is an insoluble substance and forms whenever calcium and oxalate come together, in an alkaline, neutral or slightly acid medium."

It would seem, from the foregoing, that we might conclude that it is not only necessary that we have a sufficient amount of calcium in our food, but that we must either have an excess of it or avoid all such foods as have been termed "calcium thieves."

Now, if in addition to these facts, as has been suggested (by Price and others), calcium may be a factor in our defense against disease, can we any longer ignore the simple truth that we must furnish our body cells with calcium and those other elements and conditions that promote normal calcium metabolism?

Our habits of thinking, eating, breathing; of work, rest, play, sleep, spiritual expression and character, all play their part in influencing calcium metabolism, since through the central nervous system and through elimination and oxidation, our habits of hygiene influence cell functioning for good or ill.

C. Hanford Henderson, an educator, writes[5] "The complete health of the body should be the first specific aim of education . . . . There is a diminished mortality among infants, there is a marked control in many of the old contagious and endemic diseases, but there is an alarming increase in the number of chronic ailments, in the number of insane persons, and in that company of feeble, inert persons, for whom at too early an age, life has ceased to be a joy and has become a burden . . . . On all sides, we see an increase of conveniences even of the average lifetime, but along with these gains, a distinct loss of health. The truth is that this very command of utilities has made us grow soft—we pamper ourselves too much; we overeat and overclothe and overheat, and overindulge. The unavoidable result is "degeneration." In his work, he says that he has known "thousands of boys, the majority of whom are neither strong in spirit, nor robust in body, with intellectual achievements correspondingly meager," and he further observes: "One meets few persons of even moderately good health; fewer still who are robust." You, too, must have made similar observations as regards your friends and patients.

We require no further proof of the distintegrating health of civilized countries than the flourishing of innumerable healing sciences, arts and cults. There is a need, and the supply will come from one source or another, if not from the dental or medical professions. It is not alone through the removal of dental foci of infection, however important that may be, or through improving calcium metabolism or correcting the dietary, but by a recognition of all laws of health and their application, that we shall "renew our spirit and replenish our bodies." Our short-sightedness, it would seem, lies in interference with natural laws that we can but superficially comprehend, and we should not wonder that we have lowered our defense. The human system is most adaptable, but we constantly test this adaptability to the breaking point.

5. Henderson: What is it to Be Educated? p. 71.

As a mass, we are intemperate in our habits of work, play, eating, emotional excitement, in mental and physical fatigue, shut ourselves away from the health-giving sunshine and fresh air, and marvel that our cells begin to degenerate in middle life. We have ample reason for respecting and trusting the intelligence that created this universe; yet, we manipulate the food supply provided for us, until it is no longer health promoting. We remove many essential chemical and mechanical ingredients so that it will keep better; we bleach it because we think it will look better; we boil, bake or stew it until most of the life-giving elements are destroyed, then unthinkingly mix it up because conventionalities demand it, burdening our digestive organs, and then worry our foolish heads over our susceptibility to *Streptococcus viridans* or over the malnutrition of our children.

We are still suffering from the habit of drug therapy, and it is a common observation that the public prefers vitamins or laxatives in the form of medicinal products, rather than in the form of fresh natural foods, entirely disregarding the fact that the latter source is better and cheaper. The public must be reeducated as regards health measures, and will not this academy contribute its part? For, when we remove the dental or periodontal infection, unless we change or relieve those conditions that produced the broken defense, is not the patient in the same state of susceptibility to other than dental infections?

We are told that calcium disturbances are secondary to the acid-base and toxin-neutralization governing mechanism.

Crile[6] says "The state of the acid-alkali balance in the cell becomes the measure of its vitality." According to Van Slyke,[7] the mechanisms that control the acid-base balance of the body are: 1. The chemical buffers of the blood and other parts of the body (which must come from the food or body tissues). 2. The lungs, in accelerating the rate of carbon dioxid excretion. 3. The kidneys, in excreting acid products. 4. The organism itself in forming ammonia, which is excreted.

Just what interpretation shall we place on this scientific information? Someone has said: "Truth, wherever it may be sought, is, as a rule, so simple that it often does not look learned enough." Would it not be wise, while scientific research is endeavoring to comprehend our complex organism, to estimate the danger from focal infection, and to discover the therapeutic value of chemotaxis, vaccines and radiation, for us (while lending our hearty support to such investigation) to continue to contribute our specialized service to dental patients, ever heeding the warning given us, to be cautious in our decisions as to which teeth to save. In the meanwhile, will it not appear learned enough for periodontists to discuss methods of tooth brushing and surgical treatment, if these measures will reduce to a minimum the local chemical, bacterial and mechanical irritants, which are always involved in cases of periodontoclasia; or perhaps to investigate the value of deep breathing, which results in better elimination and oxidation, both contributing factors in the maintenance of the normal acid-base balance and in metabolism; or, again, to study with a definite purpose, dietetics and nutrition so that calcium metabolism will tend to be physiologically normal; even, perhaps, to study the effect of destructive thinking on the nervous system and the glands of internal secretion; not neglecting other important phases of hygiene, such as outdoor exercise, elimination, rest and play, and the cultivation of the subconscious mind. Through an application of such knowledge gained, we can relieve some of the conditions which Price designates

6. Crile, G. W.: J.A.M.A., 77: 1155 (Oct.) 1921.

7. Van Slyke: Footnote 4, p. 56.

overload, resulting in a broken defense, such as malnutrition, exposure, worry and fear. Our training has been such as to fit us for an intelligent investigation of the laws of personal hygiene, the results of which when applied will be more far-reaching than we now recognize. Lindsay says "Applied knowledge is the world's savior," inferring that it will not be misapplied.

Why not encourage patients to use the therapeusis of direct unfiltered sunlight, to promote health, in preference to the ultraviolet ray, to cure disease?

As to dietetics, is any picture more pathetic, than the now common one in our cities of the young wife, with the artificial roses on her lips and cheek and on the table, hurriedly preparing the evening meal in her electrically lighted kitchenette? She is opening the tin cans, thoughtlessly bought at the nearest delicatessen, revealing their usually lifeless, unpalatable contents in behalf of husband, the proverbially tired business man, out of which his body cells must rebuild themselves and live. The whole wheat corpse, ready to be dissected, is lying on the prettily painted bread board in the form of practically pure starch and powdered skimmed milk. Both wife and husband are unconscious that their defensive factors will in time be weakened by this type of food and lack of sunlight and fresh air, a poor heritage for their children.

Another equally unfortunate home is that in which the planning of meals and the cooking is left to one who knows nothing of food values, food combinations or scientific cookery. In either case, it follows that the health of these families will in time be materially impaired. In other words, the defense is being broken. No conscientious mother or homemaker can longer ignore the demand made of her that she intelligently provide for her family such foods as will be health promoting. Cookery has been classified as drudgery. Scientific cookery is an art, and the kitchen a chemical laboratory. To spend hours of time in the preparation of complex meals to tickle the palate is a useless waste of energy. If we were true epicures, we would rebel against the masking of the delicate aroma and flavors of natural foods, such as occurs in the modern cuisine.

It does make a difference what we and our children eat, and this is a subject which has had sufficient discussion and demonstration, but awaits general application.

The comfortable, meaningless expression "a good average mixed diet" is too indefinite and would usually depend on individual interpretation. We should supply the body's needs. As a nation, we and our children are suffering because we have not been intelligent concerning our selection, preparation and combination of food. We are loath to admit this accusation; in fact, we quite resent it. Nevertheless, we are face to face with pages of statistics from reliable sources that prove our guilt. McCollum says that we can no longer judge of our children's nourishment by their appearance or growth during infancy; that it is the life history that counts, and we should see to it that the supply of essential food factors is safely above the borderline of malnutrition.

Since medicine and dentistry are not universally applicable, those for whom such services are denied ought to be able to build and maintain their own defense against disease. By means of applying correct laws of hygiene, especially those of diet and nutrition, this is in large measure possible. If but one national physical condition were relieved, that of habitual constipation, our defensive powers would be effectually reinforced. This condition is generally the result of faulty hygienic habits (especially those of diet) and can be relieved in most instances by their correction.

If our habits of eating are such as to disturb the delicate chemical balance of our physical organism, or to demand the

expenditure of an excessive amount of energy for the elimination of waste products of digestion, or if, because of our faulty habits of eating, breathing, exercise, etc., this elimination is interfered with, are we not then inhibiting our defensive mechanisms?

Obesity, usually associated with diabetes, high mortality from acute infectious diseases and high blood pressure; habitual constipation, a large and frequently contributing factor in a lowered defense, contraction of colds, catarrh, and digestive disturbances that interfere with nutrition, all generally result from incorrect eating, and can be relieved through the application of correct dietetic principles.

The three generally accepted deficiencies of the American dietary are those of the vitamins, mineral salts and roughage. Fortunately, these are closely associated in the outer structure of vegetables, fruits and cereal grains.

In 1868, C. M. Weeks[8] condemned the use of bolted flour, condiments and spices and the custom of peeling fruits and advised for dental caries "constitutional treatment" by applying hygienic measures.

By means of diet control, we can supply the chemical materials to meet the maximum needs of our body, and decrease harmful waste products to a minimum, thereby encouraging normal functional activity of those mechanisms that protect against disease.

Through deep breathing, constructive thinking and exercise, we can increase oxidation and improve elimination; hence, we will avoid intermeddling with the acid-base balance adjustment, and toxin neutralization, which, under normal conditions, are inclined to be sufficient for our protection against disease.

If I have given the impression that we should look to such simple factors as the diet, thorough mastication, fully sufficient rest (mental and physical), constructive thought, good elimination, outdoor exercise, deep breathing and an adequate intake of water, as the source of a powerful ally in building and maintaining our defense, rather than to the as yet but little understood vaccine and radiation therapy, then I am satisfied, since that is precisely the thought that I have attempted to convey. It does not sound learned, but it requires learning to apply advantageously correct hygienic measures.

The fundamental principles of periodontic practice are based upon laws of hygiene. We relieve occlusal stress, thereby recognizing the destructive effect of overwork and the wrong kind of work. We produce and, with the cooperation of the patient, maintain a clean environment for the teeth and supporting structures, again conceding a rule of health. We advise the use of the teeth when we recommend resistant foods and thorough mastication, and also the stimulation of the circulation in the periodontium by massage or brushing; in short, we show an appreciation of *exercise*. We remove irritation, mechanical, chemical and bacterial. To the scientist, this does not appeal as learned, but have not we, through application of these principles, obtained such results as to inspire lifetime devotion to such service? However, as has been said "Truth is many sided," so may we broaden our horizon to be all inclusive, in order to perceive all sides of the truth as it may pertain to periodontoclasia.

While science has been searching for a complete explanation of the underlying causes of dental and periodontal lesions, conscientious dentists and periodontists, by a clear understanding and correction of contributing factors in the etiology of these conditions, have been able to wage a winning war against them, resulting in a distinct service to humanity and a confidence in the future of dentistry and periodontia. Peridontoclasia, calcium metabolism, dietetics and systemic disease are interdependent and

8. Weeks, C. M.: Dent. Cosmos, 10: 57 (Feb.) 1868.

interrelated and our solution of the problems attending them lies in an intelligent elimination of interference with the operation of our complex organism by a study and application of the laws of health.

DISCUSSION

Andrew J. McDonagh, Toronto, Ont.: In Dr. Spalding's quotation from Dr. Price, we are told that "there has been practically no important progress in our understanding of the etiology of periodontoclasia." Is that really true? Has the work of Howe, Grieves and others on diet taught us nothing? Has the work of Noyes and Keith W. Dewey, in conjunction with that of Sappey and which has been corroborated by Harold Box, taught us nothing? Is it not true that we have learned a great deal from the research laboratory, the histopathologist and the observant trained traveler who has visited different parts of the world and observed the habits and customs of different people and the effect these habits and customs apparently have had on their periodontal and dental tissues?

Looking at the matter in a broad way, have we not pretty generally come to the conclusion that periodontal, and for that matter dental, lesions are the result of so called civilization. Analysed, that which concerns us most seems to be nutrition, ultimately meaning food and the use we make of it, and the use we can make of food is intimately and inseparably connected with sunlight and exercise, and if we have the proper food, sunlight and exercise the one great mental factor, worry, which in our day and generation seems to be so intimately associated with our civilization, will be a negligible quantity.

What about calcium metabolism and the balance between calcium and sodium and potassium, which the research laboratories have shown to be so important? Immediately, we ask ourselves why the Maoris, the Eskimos and many other primitive peoples are not bothered about such things. Evidently (and this seems to be borne out by travelers' testimony) these people follow their appetites, which are normal and not vitiated by the lack of exercise and by artificial sugars and similar artifices of civilization.

Therefore we must disagree with Dr. Price when he says that "Calcium metabolism disturbances are fundamental factors in periodontal diseases." Without doubt, calcium metabolism disturbances accompany periodontal diseases, in other words they are expressions or results of the same misfortune, following in sequence.

Under certain conditions I am free to acknowledge that it is very difficult to maintain a proper calcium balance; for instance take the accidental source of osteomalacia exhibited in the cows spoken of in Dr. Spalding's paper, which source apparently was an abnormal amount and a certain kind of beet top. This particular misfortune resulting from an undue amount of oxalic acid emphasizes the difficulty we must experience in keeping the proper calcium balance by a judicious choice of vegetables. We must have some other reliable method, some feeling or appetite that will be a guide to us. And when we are told that we must have a proper balance between our calcium and our sodium and potassium it complicates matters still further. Nevertheless our experience extending over a number of years and dealing with a number of people would tend to show that if we have an abundance of the proper minerals contained in the food we take, and we live active lives, Nature will balance up quite accurately the lime salts which she uses.

Now regarding the pulp involvement and invasion of the pulp by micro-organisms I have done some work along this line, assisted by Dr. Marjorie Milne and Miss Fraser of the dental research department of the University of Toronto, which goes to show that there are certain definite controlling causes as regards infection of living pulps. Our work has not been extensive enough to make a definite pronouncement but indications are that no living pulp becomes infected unless the enamel or cementum is broken, save, of course, in the invasion of micro-organisms occurring in the blood stream in certain diseases. On the other hand a large percentage of living pulps are infected if the cementum or enamel or both are broken, which means that the dentin is permeable to certain micro-organisms, whereas the enamel and cementum are not, but this is a discussion of a quotation in Dr. Spalding's paper and will be further dealt with elsewhere. As regards calcium metabolism, let me not appear to decry the importance of it, rather would I emphatically emphasize such importance. In connection with this subject, I must admit that I am puzzled to know how any decision can be made as to the ionic calcium of the blood when some research men tell us that the amount will vary greatly in a few hours and that the amount in the blood bears no proportionate relation to the amount in the saliva.

Harold J. Leonard, Minneapolis, Minn.: The academy could do no greater service than to endow a research to get the facts about some of these matters regarding the systemic and metabolic processes as related to dental disease. I suppose that no periodontist here disagrees with the conclusion made by Price, Howe, Grieves, and others that periodontoclasia is unfavorably influenced and probably caused

by errors in metabolism. It certainly seems established that in those races in which the diet is right and digestion and metabolism normal, periodontoclasia like dental caries is a rarity. And it seems logical that this error in the metabolism is in some way related to the calcium metabolism of the body. The prevalence of calcareous deposits on the teeth accompanying the ordinary diet is well explained by G. V. Black. He found that it is due to an outpouring in the saliva or the subgingival secretions of an excess of a blood protein globulin combined with calcium. This comes about from overeating, with insufficient muscular work afterwards to use up the excess of food material, which cannot be stored. Periodontoclasia is associated with condensing osteitis or rarefying osteitis of the bone about the teeth. This also points to disturbed calcium metabolism of at least a local nature.

But the exact mechanism of this disturbed metabolism as related to periodontoclasia has in no way been thoroughly worked out. Price's work is suggestive, and I hope may lead the way to the answer to this problem. I do not believe, however, that we are justified in accepting any of his conclusions in this field as proven.

This summer, I spent a good many hours in some preliminary reading and study for a research that I hope to undertake some day on the subject of this paper. I found that the subject is very difficult. Adequate methods of determining calcium in the blood are tedious. I was told by Professor McClendon of the University of Minnesota, head of the department of physiologic chemistry there and himself a student in the field of calcium metabolism, that I would need to work out a method of determining ionic calcium. I believe this is true, for an analysis of the literature on the subject failed to reveal any method in use. I am therefore dismayed at the brief manner in which Dr. Price disposes of this subject. He does not even tell who his chemist is nor describe the methods by which he determines total calcium, ionic calcium and pathologically combined calcium.

I feel therefore that, until this work is checked up by reputable scholars, we must go slow in adopting it at its face value. There is enough research material in his books to be theses for fifty candidates for a Ph.D. There has not been enough time in the last few years while Dr. Price has had a staff of technicians to do any considerable fraction of so much, to the point of final conclusions. I feel that we as an academy should be careful not to sponsor work that could not have been done with scientific completeness.

I have found many dentists who are getting this message of proper eating. They tell me that by correcting the diet of their patients, they are getting marvelous results. I ask just what they mean by correcting the diet. Their answer is: fresh leafy vegetables, fruit, whole wheat bread and milk in quantity, with a minimum of white flour food, sugar and meat. It sounds logical, and I try it on my patients. In several of my bad cases, an analysis of the weekly dietary revealed almost an ideally balanced ration. In no field of my endeavor have I found the evidence of facts in practice so at variance with the theory as regards diet and dental disease.

While I believe that faulty metabolism is the cause of most of the physical defects and degenerative disease that are undermining the health of our civilization, I wonder if this faulty metabolism is all due to the dietary. That it is largely so is undoubtedly true. The experiments of McCarrison in producing degenerative disease in a few weeks on normal monkeys by feeding them the ordinary food eaten by great numbers of people would indicate it. A study of dental disease in the races of the earth, both past and present, in relation to their dietaries would certainly indicate it. The work of McCollum and his co-workers, including Grieves, and of Howe all go to prove the same thing.

Yet, in applying the principles to my periodontia practice, the facts do not seem fully to bear it out. I am convinced that sufficient rest and repose, sufficient exercise of the right kind, sufficient interest in life, a happy environment, all play a part but secondary to the food itself and the way it is eaten.

I hope the time will soon come when we can know positively the exact relationships of these factors to each other so that we can teach the details of dietary reform and be sure we are not talking through our hats. The whole world in its health efforts is waiting tiptoe for these facts. Is there anything which dentistry can do better than promote really reliably scientific work in this field?

I wish again to say that the essayist's paper is excellent. I believe that a careful study of it and application of its principle is the key to our approach to this phase of our practice as far as present information and data make such an approach possible.

PROGNOSIS IN DENTURE CONSTRUCTION

By M. M. DeVAN, D.D.S., Philadelphia, Pennsylvania

(Read before the District of Columbia Dental Society, November, 1924)

THE term prognosis is derived from two Greek words meaning to tell before hand, to predict or forecast the outcome of a given step or action.

In denture construction, one can take it to mean to predict the final result before any actual work has been undertaken. To be able to do this, one must know the fundamental principles underlying denture construction. This involves a knowledge of the anatomy, physiology, pathology, physics and biology of the parts involved. Prothesis has too long been considered a mechanical art solely, empirically handed down from generation to generation. If it had not been for the ignorance of those whom we have to deal with and the tolerance and perseverance of "Mother Nature," even the limited degree of success in denture construction could not have been achieved.

Denture construction is an engineering project rendered still more difficult by the fact that we are building upon a living base—the latter controlled by the laws of biology and psychology. Therefore, in examining a case for the first time, attention must be paid not only to conditions found in the mouth but also to those of mind and body in general. Dr. M. M. House, of Kansas City, has pithily stated what a patient seeking denture service must contribute to prosthetic work: 1. The proper foundation, both mental and physical. 2. Perseverance. 3. Ability to handle the denture. Without this triangle, complete success in a given case is impossible.

The mental foundation or mental attitude of a patient toward dentures is half the success in a given case. So true is this that at times the denture must be made to fit the mind instead of the mouth.

In classifying the mental attitude, many theories have been advanced. Intricate psychology has been indulged in, but, to my knowledge, the simplest and most practical scheme is that of Dr. House. Patients as they present themselves for examination are placed in one of four classes:

1. The philosophic mind. The busy man or woman who has or has not worn dentures, and who has confidence in you and in your ability to make dentures that they can wear.

2. The exacting mind. The society man or woman who is very fastidious about his or her appearance, or one who has had unfavorable experience with dentures. They are not prone to be optimistic. They often demand a written guarantee that your dentures will be satisfactory or will last a certain number of years. It is almost unnecessary to say that dentures should never be guaranteed for any length of time, as no one can foretell the changes that might take place in that particular mouth. In diabetic, or pyorrhetic patients or patients of lowered physical vitality, atrophy of tissue including that of the alveolar proc-

ess is continually taking place over which we have no control. However, patients in these two classes are practice builders. When satisfied, they will recommend you to others, so that you can count on getting something more than the original fee in the way of an increased practice. The other two classes, the hysterical and indifferent types, are practice destroyers.

3. The hysterical mind. This attitude may be acquired or hereditary. The patient is nervous, highstrung, always finding fault or never satisfied. If the condition is acquired through faulty dentures, you must first proceed to get the patient back to either an exacting, or better still, a philosophic state of mind. You must preach the gospel of perseverance to them. Let them first tell you their story; listen patiently, and then point out the fact that success in any field demands perseverance and cooperation. Of course, a great deal could be done in the way of improving the dentures that he or she is wearing, but success lies only in their making up their mind that they can wear dentures and wear them with comfort. When you can get them to admit that they *can* and *will* wear them, half the battle is won—you have transferred the patient back to a more favorable type. If you cannot do this and the case is hereditary, you can make up your mind that all you'll get out of that patient will be in the form of an original fee, which ought to be correspondingly high. Regardless of the perfection of your dentures, the patient will always complain—being never quite satisfied. Making dentures in such cases, unless you clearly recognize the patient's mental attitude, will cause you to lose a certain amount of confidence in yourself, which ought to be considered an expensive loss. Dr. House claims that, from accurate records kept of patients of this type, only three out of a thousand have referred patients to prosthodontists.

4. The indifferent mind. Grandmother or grandfather went fifteen or twenty years without teeth. They are perfectly contented to "gum it." As for their appearance, they are indifferent, but some younger member of the family wishes them to look more presentable, and talks them into denture work, and they are brought to you. To start with there is not the demand nor the need, as they see it, for your services. These two elements, demand and need, must be present in all cases in which cooperation is needed. Without them, success is impossible.

To start with, owing to efforts of the younger generation, the patients wear dentures. The whole neighborhood knows that they have had a new set of teeth made. In a week or so, the dentures are found in the handbag or pocket, as the case may be. It is also known that you constructed the dentures. When they are asked why they are not wearing the teeth, the answer is that they are more comfortable without them. To recognize the various types and to classify each case from the very start is essential to proper prognosis. This is imperative in building up a prosthetic practice.

Previous habits and adaptability of patients are important factors to consider. We must never lose sight of the fact that every case we handle presents a different problem and must be solved in a different way. As I have said before, we have not only the mouth to fit but also the mind. Theories of denture construction are valuable aids, but their principles must be judiciously applied if the patient is to be satisfied and the fee collected. Our present-day methods of denture construction make for more esthetic and anatomic restorations. We aim not only to fill a void but also to

place teeth in the mouth that, by their proper vertical height, place tension on and develop the tone of the muscles of mastication and facial expression. We must forever keep the ideal in mind, and attain it wherever possible; but, for the sake of securing a practical success, we must be willing to modify the ideal. I have in mind the much discussed question of "opening the bite." Monson's ideal of open bite restorations must be carefully employed. Even he is now opening the bite gradually by constructing a series of dentures. With few exceptions, unless dentures are esthetically pleasing patients are not satisfied, regardless of the degree of retention and efficiency present. Until there is at our disposal a better imitation of the natural gum than pink rubber, the patient's mental condition and expectations should be carefully studied. Where we have a short upper lip or an unusually high lip line, the case is more satisfactorily handled by securing vertical height in the lower and by using longer porcelain teeth than consideration of face length will indicate.

With patients who have not worn dentures, little modification from fundamental principles need be made. We can act more freely in reference to the amount of opening, which is desirable. Arrangement of teeth in reference to ridge, and the relationship of the lingual surfaces to the tongue, are for us to determine, bearing in mind esthetics and laws of leverage; but, with elderly patients or with those of little perseverance and adaptability, one should exercise caution when deviating from the set-up of a denture that they have worn for ten or twenty years. Do not hesitate to make dentures for them—you can invariably improve on plate outline and articulation over that of a denture made ten or twenty years ago.

Now let us return to the physical foundation as found in the mouth. Even prior to this, the age and health of the patient should be noted. Other things being equal, the younger and healthier the patient, the greater our chance of success. That you cannot teach an old dog new tricks is true with dentures; for the successful manipulation of artificial teeth is, indeed, a difficult trick to master.

First of all, the outer appearance of the patient, especially the lower third of the face in the region of the lower border of the nose to the chin should be considered, the operator feeling the skin covering this region and noting the tone. If teeth have been out a considerable length of time, the muscles of mastication and those of facial expression have lost their tension, as a result of which the tissues of the lower third of the face have become flabby, and the corners of the mouth droop. The lower lip pushes the upper upward, actually shortening its length; thus, the inaccuracy of following the lower border of the upper lip in forming bite plates. If this is done, we maintain the deformity rather than encourage regeneration and the redevelopment of normal facial dimensions. Then, again, the nose broadens; and the folds running from the alae of the nose to the corners of the mouth become accentuated into chops. All this can be partially overcome by having bite plates of proper vertical height and the labial and buccal flanges of dentures of suitable height and thickness, thus getting tension on the muscles of mastication and facial expression and encouraging their redevelopment.

The next step is the digital examination of the mouth. The softness or resiliency of the overlying mucosa should be noted. An ideal mouth is covered with a mucous membrane that gives a millimeter or so on the application of pressure. This resiliency, provided it

is uniform, will best withstand the varying stress of mastication, the force being transmitted equally throughout the entire plate area. A mouth covered with thin, leathery, hard mucosa offers difficulty in securing adhesion and also in maintaining it during mastication. On the other hand, a thin mucosa may be delicate and sensitive, irritated on the slightest provocation. The condition of the facial skin of the patient will invariably indicate the nature of mucosa to be found in the mouth. A sensitive skin will, most often, be accompanied by a thin sensitive mucous membrane, which offers difficulty in denture construction. It is the condition of this base mucosa and not the size of the patient's purse, that ought to determine whether a gold base denture is to be constructed for a given case. It has been proved to our satisfaction that, underneath a gold denture, the mucosa thins down and hardens more; while the reverse is true underneath vulcanite, the mucosa becoming thicker and more resilient, owing probably to the closer adaptation of vulcanite to the mouth with the exclusion of air between denture and mucosa, thus causing a cupping and sucking action to be brought into play, resulting in slight proliferation of mucosa cells. It follows, then, that the harder and thinner the mucosa, the more clearly indicative it is of a vulcanite denture; while a thick and resilient base is better handled by a gold base denture. Under gold, the mucosa is hammered down, as it were, becoming thinner, probably owing to lack of absolute adaptation and irritation.

Next, the size of the mouth should be noted—whether it is large, medium or small. Other things being equal, the larger the mouth (provided you can get a tray large enough to receive it), the more advantageous it is for the development of adhesion and stability. But let me here sound this warning: The fact that a mouth is of large size is no indication of an ideal case; for, in such a mouth, the vault may be high and tortuous, the ridges thick and round and unsymmetrical, the tuberosities large and undercut; and the mucous membrane may be hard, unyielding and leathery. In such a case, surgical interference is certainly called for in ridding the mouth of undercuts, buccally and labially, so as to permit the development of flanges on our dentures high enough to come in contact with the soft border tissue and thus insure adhesion during mastication.

Then the type of arch should be noted—whether tapering, square or ovoid. The size and form of both upper and lower jaws, and the relationship of the upper and lower jaws to each other should also be noted. Whether there is normal relationship or a prognathous or a retrusive one is important. The lack of symmetry of physical size of the mouth is liable to give one a protrusive or a retrusive case; i. e., if a large upper is combined with a small lower, we have an orthognathous or retrusive lower when we come to the set-up; while a combination of a small upper with a large lower means a prognathous or protrusive case. The latter is more often the case when ill-fitting dentures or no dentures have been worn for years. In the process of resorption, the upper jaw is rendered smaller, while the lower becomes larger. This is due, no doubt, to the direction of the long axis of the natural teeth, which is upward and outward in the upper, while the reverse is necessarily true in the lower—being downward and inward. Then also the outer cortical layer of the alveolus of the upper suffers greater resorption than the inner, while fairly uniform resorption occurs to the two cortical plates in the lower. Thus, it is disadvantageous to permit patients to go with-

out dentures or to wear ill-fitting dentures for any long period of time.

The varying shapes of the upper and lower arches will also result in dissymmetry; that is, a tapering upper arch combined with an ovoid lower. This combination offers difficulty in setting teeth up, especially with jaws of different size. The relationship of mouth size and arch form of the upper and the lower is important, so far as it affects articulating, coordination or the setting-up of teeth. The laws of leverage must not be violated if satisfactory dentures are sought. Lack of symmetry in size of upper and lower will, oftimes, if we are to heed laws of leverage, call for a set-up that deviates from normal; that is, a cross bite set-up. This reverse scheme should be resorted to whenever it will minimize leverage by placing upper and lower teeth nearer the crests of their respective ridges. The greater the resorption in a mouth, the greater the need of cross biting. The result of resorption in the upper is a smaller arch, while the reverse is true in the lower. In cross biting, the upper right teeth are set on the lower left side and the lower left on the upper right. In doing this, the upper first bicuspid is thrown out, or if the anteroposterior length will permit, an extra lower bicuspid is added to the set. This is done in order to preserve the normal anteroposterior relationship of the teeth, the lower teeth being the width of one-half a cusp anterior to the corresponding upper. There ought to be no hesitancy to cross bite, as efficiency depends on proper interdigitation of cusps, sulci, planes and facets; and reversing their order without in any way altering their relationship does not interfere with their efficiency.

Next, the muscle and tissue attachments and border tissue are noted. With the index finger placed in the buccal space and vestibule of the mouth, between the process and lip and cheek, pressure is exerted upward and outward and downward. The height of attachment with reference to the crest of the ridge and the resistance of border tissue is noted. As I stated in the beginning of my paper, a more thorough knowledge of the anatomy and physiology of the mouth ought to be possessed by the practitioner desiring success in denture construction. It is not the purpose of this paper to go into detail in describing the muscles of the face, but I hope that it will promote interest enough to lead you to open once more the dusty pages of Piersol or Gray, and glance over the muscles attached to the maxillary and mandibular bones. Their origin, insertion and actions must be familiar to you if efficient esthetic dentures are to result from your workmanship.

Briefly, let me go over the muscles that play on the periphery of our dentures. If you have done any prosthetic work at all, you know from experience that their play is pretty rough at times and, if not accommodated, they may resort to foul play—tripping the dentures.

In the upper arch, starting from the tuberosity and coming forward almost to the canine eminence, we have buccinator muscles attached. These muscles can be accommodated by softening the periphery of our modeling compound base impression in the bicuspid and molar region. While the operator is holding the impression firmly in place with the index finger of one hand, the patient is instructed to close, suck and swallow.

Whenever it is desired to bring the buccinator muscles into functional activity, the patient should be instructed to close the mouth and at the same time to suck and swallow. Then again we must accommodate the attachment of the masseter muscles at the junction of the molar bone with the body of the

maxilla in the first molar region. Failure properly to relieve the denture for the functional freedom of this muscle is accountable for more tripping of upper dentures during functional activity than any other one cause. Coming forward toward the front of the mouth, we note the origin of the levator anguli oris in the canine fossa, the muscle that elevates the corners of the mouth. Please note that we treat this muscle in a very singular way. Instead of trimming the periphery of our modeling compound tray to the full functional freedom of this muscle, we further build our periphery so as to hold this muscle, together with the adjacent tissues, under slight tension. By doing this, we mechanically raise to somewhat near normal the drooping corners of the mouth. With the extraction of the long rooted upper cuspids, tension on the levator muscle is destroyed, the result being the sinking inward and downward of the corners of the mouth. This fact, combined with the encroachment of the lower lip on the lower border of the upper lip, causes an exaggerated appearance as of a shortened upper lip. Natural teeth, with their normal vertical length, assure normal lip length by maintaining the proper distance between the nasal spine and the symphysis of the mandible; but with the extraction of the natural teeth, normal facial dimensions are destroyed, the chin making an almost successful attempt to meet the base of the nose. With this upward and forward excursion of the chin, the lower lip naturally pushes the upper lip upward. If this condition is not corrected by a set of artificial dentures of proper bite length, the framework and appearance of the lower third of the face is seriously impaired. If the denture is of proper vertical height, the normal tension on the muscles of mastication and facial expression are restored, and redevelopment of these organs is brought about. Often, the immediate result, esthetically, is not so pleasing; that is, too much tooth form is in view when the patient is smiling; but he should be urged to be content until the facial muscles readjust themselves and normal lip length is attained. I might dwell on this point a little more emphatically at this time: as a general rule, artificial dentures are not made long enough, lacking the proper vertical height in bite plates. I appreciate the fact that the nearer teeth are set to the crests of the respective ridges, the more leverage and strain on the base of dentures can be minimized. On any kind of a dilapidated impression, if one sets teeth directly over and above the ridge, the denture will be tolerated without irritation in the mouth; but it takes a scientific impression and one that contains the maximum amount of plate area, including flange height right up to the functional path of the peripheral muscles, to withstand the stress of dentures sufficiently high to restore lost facial dimensions.

If I may use the comparison; you don't have to worry about the foundation if you are putting up a one-story building, but, with skyscrapers, it is necessary to dig quite deep and get a firmer foundation upon which to build. I don't say it is possible in all cases, but when you have the foundation, it should be utilized and dentures built that not only enable patients to masticate, but also restore the proper vertical facial dimensions; that is, effort should be made to keep the chin a respectable distance away from the nose when the teeth are in occlusion.

Turning to the muscles that confront the periphery of the lower dentures, we have more definite landmarks to follow. Buccally, on both sides, the buccinator muscles are attached to the external oblique line. We cannot go buccally to

this line with the lower flange without infringing on the free musclar action of this most important auxiliary muscle of mastication. In determining plate outline, buccally, the external oblique line must be followed until the apex of the small retromolar triangle located beyond the alveolar process is reached. Here, turning inward and following the internal oblique line, the base of this triangle is reached. Adhesion is not possible in most lowers unless this triangle, which is a soft resilient mass of tissues, is included in the plate outline.

On the lingual side, we are confronted with an important muscle, the mylohyoid attached to the full extent of the mylohyoid ridge. This muscle forms the floor of the mouth and is very active in swallowing. Except in very few cases, in which muscular action is very weak, one cannot infringe on these muscles by extending the lingual flange of the denture below the mylohyoid ridges. Not all lower cases permit a lingual flange, especially those in which maximum resorption of the alveolar process has taken place. One should recognize these cases in which the mylohyoid ridge is in line with crest of ridge and not waste energy in trying to develop flanges that later irritate the patient and have to be cut off. Lingual flanges that press against the mylohyoid muscles will cause one of two things, either the denture will be raised off the ridge or, if strong adhesion is present, swallowing becomes painful. Patient has a feeling that his throat is sore. This can be overcome by cutting the lingual flange so that this important auxiliary muscle of mastication is left free and active. Care must be taken not to go beyond the functional path of the frenum of the tongue. I know of nothing that raises lower dentures off the ridge more than the failure to clear this frenum. The frenum of the tongue is formed by geniohyoglossus muscles that have their origin in genial tubercles located on the lingual side near the symphysis of the mandible. The frenum of the tongue, as it affects the periphery of our denture, is a broad fan-shaped attachment unlike the V-shaped frenum of the upper lip. Therefore, clearance must be broad, sometimes reaching a breadth of as much as three-quarters inch. The depressor anguli oris and levator menti muscles must be cleared.

The stabilization of the upper denture is simple as compared with that of a lower. In the upper, we can utilize the hard palate in securing adhesion. Then, again, we have only a group of labial and buccal muscles to contend with. On the other hand, plate area is materially less in the lower with antagonistic muscles on the lingual as well as buccal and labial muscles. Further, the powerful mass of muscle tissue, the tongue, does all it can on the initial insertion of a lower denture to throw it out. Permanent adhesion is only possible in favorable lowers with prominent ridges, accompanied by muscle and tissue attachments, fairly away from the crest of the ridge. In the average lower, if permanent stability is attained, efficient mastication can follow. The extension of the lingual flange in the region of the retromolar triangle to include the retro-alveolar space on both sides gives us a mechanical undercut that will permanently anchor the lower denture to the ridge and help to overcome the dislodging influence of the peripheral muscle.

The taking of impressions has too long been considered a digital art solely, comparable to the performance of a magician where certain knack and good fortune were essential for success.

While it will be granted that parts of

which we desire to take an impression differ in every case, since no two mouths have been found that are exactly alike, yet all mouths have much in common, and it is these points of similarity that give us fundamental principles to guide us in our impression work. Only after one has mastered these is one in a position to take a good impression or to recognize a good impression after he has taken one. Dr. Patterson, of Baltimore, states the case well when he says "An impression is to be regarded in the same light as an X-ray picture—it is worthless unless one can read it."

The failure to appreciate and apply fundamental principles in impression taking is responsible for the hit-and-miss methods that have been handed down. A more thorough knowledge of the anatomy and physiology of the parts involved should be possessed by the practitioner desiring success in impression work. Then, again, a technic should be mastered that will enable him to utilize in a practical way the knowledge thus gained. The method or technic employed should enable dentists to serve and at the same time to earn. It should also be comparatively simple and mastered readily by the average practitioner. Plaster-of-Paris remains the material parexcellence for the taking of impressions—but not alone. It must be supported and carried to the mucosa in an individual modeling compound tray, the flanges of which extend up to the functional path of the peripheral muscles with a certain amount of displacement of the soft border tissue up against the bony framework.

The usual method of taking impressions with straight plaster, which does not permit of slight modification or correction, necessitates the discarding of an almost perfect impression and the taking of another that may have other imperfections, so that the final result is always a compromise, the best of two or more impressions being selected. The well-known remark of a former teacher of prosthetics on being shown a plaster impression taken by a student in the clinic "—Fine—fine; would make a fine door knob—go get your plaster bowl and spatula," is quite amusing as a reminiscence, but at the time it was uttered, we could not see a bit of humor in it.

Let me state, briefly, a few fundamental principles applicable to impression taking of all edentulous mouths: First, other things being equal, the greater the plate area covered by an impression, the greater will be the force of retention in the finished denture, therefore, cover as much area as is possible, carrying labial and buccal flanges right up or down as the case may be to the function paths of the peripheral muscles. In upper impressions, this means high labial and buccal flanges with the heels of the impression covering both tuberosities slightly beyond the junction of the hard and soft palate. In lower impressions, this implies carrying the buccal flange at least to the external oblique line; the lingual flange to the mylohyoid ridge, and labially, to the functional paths of the peripheral muscles. The heel of all lower impressions should include the retromolar triangle, a soft pad of resilient tissue located distal to the alveolar process. The lingual flange of heel should be carried to include the retroalveolar space, located below and behind the alveolar ridge at this point. The periphery of all dentures should end on soft resilient tissue. This means carrying flanges of dentures beyond the alveolar ridge up into the soft peripheral border tissues. It is possible in most cases, especially in uppers, to displace soft tissue favorably up against the bony framework and thus develop higher flanges to the impression.

All flanges should have thick round cylindrical margins. The periphery of a denture never should be less than one-eighth inch in thickness. Buccally, it can be as thick as a quarter of an inch advantageously. Soft tissue can be displaced and held in a more favorable position by a smooth cylindrical border; whereas a thin sharp flange would irritate under similar circumstances.

Uniform distribution of masticatory stress should be secured throughout the entire plate area. In taking our impression, we must constantly keep in mind the purposes it will eventually serve. In addition to maintaining retention, an impression must distribute masticatory pressure to the base of the support. It must do this in such a way as evenly to proportion it throughout the entire mucosa. Only when this is done will dentures be worn comfortably without irritation and subsequent changes of alveolar process. Clinically, this implies the taking of a base impression with modeling compound of uniform softness and thickness throughout the entire tray, with pressure applied in line with masticatory stress. The pressure employed should be about the same as that applied to the mucosa during mastication, which will insure uniform and favorable displacement of the resilient mucosa. Uniform distribution of pressure will follow when there is continuous contact of the denture with the mucosa, except for slight relief over hard areas.

Failure in full upper and lower denture work following the use of straight compound impressions has too long been attributed to overcompression of tissue resulting in so-called strangulation and atrophy of the parts involved. The cause of failure in most cases is undoubtedly lack of uniform contact of the impression with the mucosa. It was with this thought in mind that the late Dr. Wilson warned us against the use of a straight modeling compound impression, branding it "deceptive material" in the hands of most men. For, ofttimes, marked adhesion in the impression is due to overextension or peripheral contact only. A denture vulcanized on a model made of this impression would naturally throw all masticatory stress to the periphery, resulting in irritation and subsequent absorption of process.

Then, again, it must be borne in mind that articulation is an important factor in the maintenance of efficient adhesion. Many dentures showing marked adhesion when they are first inserted in the mouth become "loose" as it were, after a lapse of six months or so, often because of a lack of properly balanced occlusion.

Parts of the impression overlying vascular areas should be properly relieved so as to insure a normal blood supply to the base of the support. The posterior palatine foramina on both sides and the nasopalatine are to be considered in the upper; while the mental foramina will oftentimes demand consideration in the lower.

Maintenance of contact of the impression with the mucosa during functional activity should be insured, which will result in adhesion during use of the denture. To secure contact of the heel of the upper denture, impressions should always be postdammed. Prior to postdamming an upper impression, plate outline at the heel should be properly secured, slightly beyond the junction of the hard and soft palate. The height and width of the postdam are determined by the compressibility of the tissues in this region and the extent of area covered by the soft resilient base. During swallowing, the soft palate is elevated, shutting off communication between the oropharynx and nasal pharynx. Proper

postdamming prevents a break of contact during this action. In addition to maintaining adhesion, it does away with gagging caused by an occasional break of contact in this region.

Success in impression work depends largely on the operator's knowledge of what constitutes proper outline form. To secure this, one must master the fundamental principles involved and then select one of the many methods or technics best suited for his own needs. A technic is nothing more than a sequence of accurate steps taken to arrive at a definite conclusion. The final result of a technic is an efficient impression, which should be conceived before any actual work has been undertaken.

The foundation of modern impression work can justly be said to have been laid down by the Green brothers. Then, into this field came a host of others, each adding something to our total knowledge. Hall, Supplee, Tench, Patterson, Clapp, Giffen, House and Monson have rendered valuable service in this field of endeavor; but, as in all other work of a pioneering nature, points of imperfection were present, and today we are better able to pick the wheat from the chaff.

The two requisites of a good impression are proper outline form and adaptation. They are best secured by a combination of plaster and impression compound. Modeling compound is the material parexcellence for securing outline form, as plaster is for securing adaptation. A base impression can be taken with this material molded in a brittanica tray of proper size (Nos. 1, 2 and 3, uppers, 1, 2, 3, 18 and 19 lowers); then, by softening the flanges of this overextended base impression and bringing the peripheral muscles into functional activity, proper modification of flange height can be secured. If into this impression of proper outline form and flange height soft plaster-of-Paris is poured and inserted with pressure into the mouth, adaptation is secured.

Proper outline form and adaptation will always result in adhesion, if it is at all possible to secure it in a given case, and the final result of this combination is always an efficient impression, which is essential for the construction of a comfortable denture.

CONCLUSION

By knowing the mouth and its contents in detail, one is able intelligently to diagnose the case and thus arrive at a prognosis that is scientific. To be able to do this will save time, money and, what is more, one's confidence in oneself. It is a discouraging thing to fail and not know why. When the fundamental principles that underlie denture construction are mastered, there will be no accidental successes while all failures will, at least, be scientific. Failure results in a given case because there was lacking the mental or physical foundation upon which to build. To be able to tell beforehand the degree of success possible in a given case will help one to arrive at a more just compensation for services. There is no use running into trouble when it is seen ahead. Let your motto be "Study and Know the Foundation."

FOCAL INFECTION

By CHARLES H. MAYO, M.D., Rochester, Minnesota

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IT IS a pleasure to appear before the dentists of America, who have placed dentistry on such a high plane in the educational requirements, and who are making efforts to effect greater harmony between medicine and dentistry. Their training and their mastery of detail and technic have made possible and necessary the several divisions of dental practice, all in the little area of the mouth.

The first dental college was opened in this country in 1842. Before that time, doctors and dentists were educated largely through apprenticeship to physicians and those interested in dentistry, and "by walking the hospitals," as it was called. During such training, certain physicians became especially attracted to dental work, which was quite limited. Physicians and dentists, although originally developed along the same lines, have become somewhat widely separated, and it is high time that they come closer together again in their work. In the general field of medicine, the greater dependence on laboratories has reduced the power of observation, while within the mouth there is more to be seen relating to acute and chronic disease than elsewhere. The serious infectious and contagious diseases of the world, destroyers of human life *en masse*, have now almost disappeared through knowledge of their cause and prevention. By paying more attention to the prevention of diseases that destroyed the lives of babies and children as well as those of older persons, we have advanced the average lifetime of man to 58 years. Now man is dying an individual death; and few of those who should know, and almost none of the public, seem to appreciate the fact that sickness and death from acute chronic infections (those bacterially caused) account for 87 per cent of all deaths.

One-third of our young men from 21 to 31 years of age were wholly disabled for war duty, as shown by the draft, 7,000,000 were examined but only 4,500,000 were accepted. The diseases and disabilities of the majority of those rejected were largely due to the lack of knowledge of parents, or whole communities, with regard to disease, its cause and prevention.

We are all slowly becoming educated. The specific microbe of most diseases is known, and even if the microbes are unidentified, we know their method of work, and can develop vaccines and serums to prevent or limit their destructiveness. The hardening of blood vessels; the changes in many chronic brain lesions; disseminated sclerosis of the spinal cord; chronic nephritis; stones in the kidney, ureter and bladder, the recurring rheumatism of muscles and joints, large and small; the chronic recurring diseases of the eye; iritis, retinal and choroidal troubles, and neuritis, are some of the more common diseases that

we now know to be due to infections. Investigation has proved that those who suffer from such diseases carry a focus that, with varying degrees of health, exhaustion or even climatic changes, may afford an opportunity for the bacteria to be thrown into the blood stream and create a recurrence of those diseases which, in the past, were treated as entities, primary, not secondary, as we now consider them. The greater percentage of such infective foci are in the mouth. Small, closed alveolar marginal pockets, abscesses at the roots of dead teeth, and devitalized and crowned teeth all afford opportunities for infection, with the break in health that must eventually come to all. They may locate in the heart and thus add to the high and still growing death rate from heart disease; 150 deaths occurring from this cause each year in 100,000 in this country, usually without warning. Fortunate indeed are they who have the secondary foci in a nerve, as in neuritis, or in a muscle, as in muscular rheumatism, so that time and opportunity may be afforded for investigation.

Very few old persons have fully preserved teeth. Most of them have lost their teeth and have worn plates since the fifth decade of life. The presence of a dead nerve in a tooth will prevent appreciable local reaction; and although its possessor is possibly enabled to eat better for a time, he is conducting his health on borrowed capital, as he may not have a physician or a dentist who will appreciate that the sickness or broken health that may develop is due to such an apparently trivial cause.

We ask much of the roentgen-ray in the investigation of tooth and jaw conditions. The infecting substance may present a shadow so small that even in a tooth known to be infected it does not show, or it may be lost in the range of the shadow of the tooth itself. Those who understand the reading of roentgenograms may learn much from Nature's handling of calcium, in comparing bone conditions of the two sides of the jaws, and with other infected teeth. The condensing or rarefaction indicates Nature's type of defense against infection by walling off an infected area or increasing its blood supply after the removal of the calcium. Comparatively few physicians understand the reading of such roentgenograms. The condition of the teeth then means much to the one who is searching for the focus of infection and the type of tissue reaction, and also to persons now comparatively well who may in the future develop a variety of diseases that destroy health and happiness, if not life. Because the secondary lesion is not recognized, the dangers of focal infection are discredited until too late, in diseases of the heart, kidney and bloodvessels.

The tonsils, as a rule, carry the same organism as that which causes the loss of teeth, each individual probably having his own specific organism, which may be wholly different from that of his neighbor or other member of his family. Mine is *Streptococcus viridans.* Others may have *Streptococcus hemolyticus,* as well as other varieties of the green-producing streptococci. Such organisms may have an affinity for almost any tissue in the body, and by failure to clean up focal infections today, persons are neglecting themselves until such time as they are again laid up with troubles of known or unknown cause, and are dependent on the interest dentists and physicians may take in the investigation of the cause. If one case, the result of focal infection due to bad teeth is erroneously diagnosed, regardless of the condition of the teeth, and if the teeth are removed without relief of the sec-

ondary disease, the theory of focal infection and its elimination is discredited with all who know the patient, and with the dentists and the physicians concerned. In many cases the tonsils have not been eliminated, or there has been no roentgen-ray examination of the jaws and teeth, local evidence being depended on to prompt special examination.

With regard to infection of the tonsil, consultation with the throat specialist may not improve the situation since he may consider that the small tonsil, size 1 or 2, gives no evidence of disease, even if the history indicates that the patient has had many attacks of tonsillitis in early life. For tonsils graded 3 and 4, large because of reaction against infected pockets within them, the specialist would recommend removal, although their size and reaction confer immunity against diseases at a distant point arising from a focal infection. Small tonsils with small pinhead abscesses carry as much infection as would several teeth with root abscesses.

In addition to investigation of the teeth and tonsils, infection should be looked for in the prostate and seminal vesicles, and in the cervix uteri, especially the glandular areas behind the cervical lining. In these areas, there are usually various types of streptococci that cause the rheumatism of the small joints, the myocardial and renal infections. In young men and young women, they also account for rheumatism of the large joints, being due to gonococci and associated bacteria. Why are some persons more susceptible than others? The susceptibility is an inheritance, the amount of resistance being due to the mineral content of the blood. There are but fourteen of the ninety-two elements that make up the world that are carried in the blood in almost an exact quantity, sustaining, replenishing and rebuilding in health. At some period in the life of all persons, there comes a break in the absolute stability of one or more minerals, which changes the resistance in the blood, and makes them susceptible to disease germs. Blood tests will show these changes, and if we desire to know the danger of foci that we carry with us, animals may be inoculated by these bacteria, and by their selective affinity for the different tissues of the body will show quite definitely where our danger lies.

Ten years ago, at my first meeting with the members of the dental profession, I suggested that the next great step in medicine would be made by the dentists, and they are making, in fact have made, several steps. Through their dissemination of knowledge concerning infection in the mouth, the public has become more and more interested in the prevention of individual disease and is demanding more of physicians.

Discussion

A. C. Scott, Temple, Texas: Dr. Mayo said only too little about the work concerning focal infections which has been done in the Mayo Clinic. Dr. Billings, Dr. Rosenow and his associates have worked out some scientific facts that are startling, and limitless in their possibilities. In view of these facts, we are now justified in looking forward confidently to the time when other men of science may take advantage of what has been thoroughly demonstrated regarding focal infections and lead to the discovery of better methods of immunization, which will enable us to prevent or effectually compete with diseases before they have done much harm.

In our mad search for focal infections, which are the cause of certain troublesome diseases, we undoubtedly commit many errors. We must not forget that focal infections at the roots of the teeth may be due to infections located elsewhere in some unsuspected place. If the infection does not produce any local soreness or pain, or make some other kind of trouble, it may go undiscovered until the patient has sacrificed all of his teeth, and possibly until such time as a postmortem examination reveals the source of it. I have often noticed that dentists are kept busy defending

the teeth against the snap judgment of the surgeon and other clinicians. We cannot lay too much emphasis on existence of focal infections outside of the mouth. We have charged up too much to teeth already.

I recall a patient with fairly good teeth who had had all sorts of clinical examinations and investigations made. They were apparently very thorough, and were made by some of the best clinicians in this country. It seemed that no one was able to find the source of the infection. After a while, the patient developed a perianal abscess, but, because of the fact that this abscess was of such slight character and revealed so few symptoms, she thought she had slight hemorrhoids, and had misled the physicians who had examined her repeatedly. When she finally developed an acute abscess she stated that she knew there was something wrong all the time, but thought it was some small harmless hemorrhoids. An investigation revealed the fact that the patient had a streptococcic infection in this abscess and after the abscess had gone through its acute stage and was properly drained, the symptoms began to subside almost at once.

Another instance of remote infection that was overlooked in a similar manner was that of a girl about 18 years of age. Fortunately, she had a perfect set of teeth and perfect gums so that everyone who started an investigation became discouraged about charging it up to the teeth. She had no evidence of any tonsils at all. There was apparently not the slightest evidence of infection anywhere that could be found. After the girl was sent home (we had given up all hope of finding infection) we decided that perhaps we had not made a sufficient investigation. She had become a total cripple and many of her joints were permanently stiff. She returned, at our request, and in a systematic way we began with the head, examining her sinuses, and then her ears, and then going over her chest again, finally making the examination as complete as we could. We concluded, as a matter of form, to examine her feet, and we found that, without any previous complaint whatever, she had been suffering from suppurating ingrowing toe nails for three years which tallied exactly with the period during which her rheumatism had been giving her so much trouble.

We ought to work together in harmony because of the great difficulties that may be encountered in getting at the truth and because of the fact that we owe the public a great debt. The public must look to professional men for their salvation. There are people dying all over this country every day from preventable diseases, not the least of which is focal infection, which may start in the mouth. The time is coming when we must get busy and educate the people regarding their own safety. We must teach them that it is better, much easier and much less costly to prevent disease than it is to cure it.

R. L. Haden, Kansas City, Mo.: There are a few points needing emphasis that come up in the application of the general principles of focal infection to the individual patient as we see him in practice.

First of all, it seems to me there is the very greatest necessity for the gathering of data, particularly bacteriologic data, concerning the status of the pulpless tooth. There is a great difference of opinion and a great lack of knowledge among most of us, certainly among medical men, as to the frequency of infection around a pulpless tooth that shows nothing in the roentgenogram. The question is continually coming up in individual cases as to the probability that such a tooth is the focus for systemic disease. We need both more data and better utilization of the data we already have along this line.

The second point I should like to emphasize is that patients should be studied a great deal more as an entity. I think medical men particularly are too prone to consider the teeth as apart from the body, as if they belong to some other field than medicine. Likewise, the dentist is likely to consider the teeth as a separate field and not as a part of the clinical picture of the patient.

Another point that cannot be stressed too much is care in prognosis in individual cases. The proof of a causal relation of a focus to a disease is a very different thing from relieving the diseased condition by the removal of the focus. We tend to expect too much from the removal of chronic foci. The one thing that causes a great deal of grief is a lack of care in prognosis, and the failure to take fully into consideration the different factors that enter into the individual case.

A multiplicity of factors enter into every case of focal infection. One I would like to emphasize particularly is what might be called the constitutional factor. There is certainly a great difference in constitutions in respect to susceptibility to disease and reaction to bacterial stimuli. We are getting back, in a way, to the diatheses of the older clinicians, and are thus emphasizing factors other than the local infection alone.

The final point to be mentioned is one which, it seems to me, is not stressed enough in meetings of this kind, In all cases of dental focal infection, we should consider how the infection arose. It practically always arises, we know, as the result of dental caries. The fundamental problem, then, in this personal preventive-medicine campaign that we are having, which will do most good for the future generation, is the prevention or at least the lessening of the incidence, of dental caries.

A GENERAL CONSIDERATION OF ROOT-CANAL THERAPY

By EMERSON R. SAUSSER, D.D.S., Philadelphia, Pennsylvania

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

IN the early seventies, Robert Koch and Louis Pasteur demonstrated beyond a doubt the truth of the germ theory in disease. Shortly thereafter Willoughby D. Miller demonstrated the germ origin of dental decay, and, in a series of essays entitled "The Human Mouth as a Focus of Infection," brought before the medical and dental world the fact that the mouth plays a vital rôle in bodily health and disease.

Although the marvelous works of these three immortals marked the beginning of a new era in medicine, and although their findings reported nearly forty years before had proved astounding by virtue of their accuracy and far-reaching importance, it was not until the notable address of Sir William Hunter, in 1910, that serious and widespread attention was given the subject of the insanitary mouth. Hunter reported his clinical findings, and showed the menace of defective and faulty mechanical dentistry and the unclean mouth to bodily health. The dental profession felt keenly the sting of his arraignment of its shortcomings, while the public press put the laity in an inquisitive frame of mind.

The dental profession, through splendid leaders, had for many years preached the importance of the clean mouth, yet it took the world-wide publication of the utterances of Hunter and Osler to give mouth hygiene the needed impetus. All phases of dentistry felt the effect of this impetus. The soft tissues of the mouth and the pulpless tooth immediately received intensive thought and investigation in both research laboratory and clinic. Through necessity, there soon followed changes and improvements in our mechanical procedures to meet the high standard of sanitation demanded in the teachings of Hunter.

Dentistry made rapid scientific strides in the years following Hunter's address. The period is replete with one new advancement after another, and dentistry, by reason of its own efforts toward efficiency and recognition, finds itself today a vital factor in the greatest of all advances, the world-wide movement for better health. It is universally acknowledged that dentistry is essential to this general scheme of preventive medicine, and it is fully expected to take its normal place in the general scheme along with other specialties of medicine.

This awakening and sudden recognition had a powerful psychologic effect on the mind of the dentist, who responded with a desire for higher ideals and higher standards; so that we now find him with a broader conception of his relationship to the general problem of public health.

Yet what progress has been made in the problem of the pulpless tooth as it confronts the dental practitioner today?

What disposition can he make scientifically of the question in its relationship to public health? In other words, what is the present status of canal therapy following these fourteen years?

The average dental practitioner, with higher ideals and higher standards, has been putting forth his best efforts during these years to cope with the problem at the chair. In the beginning, he was told that to deal with the conditions required study, technical skill and conscientious judgment, if he cared to consider himself an asset to dentistry and humanity; also, that, in taking up canal therapy, he must appreciate the seriousness and delicacy of the work; he must form a proper conception of the subtleness of infection and the causes of reinfection; he should work out the problem as to how he can economically, with his surrounding conditions, give proper attention to this phase of dentistry. If he cannot meet these requirements, it would seem that an ultimately successful conclusion to the work will not be possible, and the patient would be far better off with the tooth extracted.

That he has tried to meet these requirements is evidenced by the growth of study clubs, the spread of organized dentistry and the increased demand for dental literature. These educational activities have been of broadening value to him, but have not greatly helped him solve the problem at the chair. He has improved his technic in root-canal therapy generally, yet when it comes to histology, pathology and bateriology, he is, as a rule, fundamentally lacking because of deficient early training. He cannot think in these branches of science, and is therefore mentally incapable of discerning what is fact and what is fiction in the writings of the day appertaining to the pulpless tooth. He is not able to interpret in the roentgenograms or in the tissues the attenuated structural changes necessary for a differential diagnosis. He is interested, since the patient in question has a tooth condition which presents an involvement of the periapical tissues; but since he knows no simplified classification of such pathologic conditions, he feels insecure in his prognosis. However, true to his ideals, he believes that it is more scientific to save the tooth than to extract it. How can he find the fine line of demarkation that tells him which cases it is safe to treat and which it is not? If he decides to retain the tooth, he and his patient must submit to an exacting procedure in way of canal therapy that, in reality, only a skilled specialist, under favorable conditions, can scientifically conclude with any degree of assurance.

Such a picture is not presented in a spirit of levity, nor in an effort to detract in any way from the splendid efforts that are being made by investigators, and that must, by all that is proper, be continued in an endeavor to solve the problem of the pulpless tooth. The effort has been made to point out the confused state of affairs that engulfs the average conscientious dentist, who is endeavoring to meet his obligations to his profession and to the general public. It is the average general practitioner who must stand the brunt of the problem, as the pulpless tooth, with apparently unsurmountable obstacles surrounding the problem of its care, is universal, and his services are more in demand than are those of the specialist.

In its present status, canal therapy does not meet the urgent demand of the public today. To suggest a possible way out of the dilemma, one must state the existing facts, which are fundamentally wrong.

1. The awakening following Hunter's address found dentistry unprepared scientifically to meet the demands of medicine.

2. The individual practitioner is necessarily lacking in fundamental training to solve the problem without proper direction.

3. The dental profession has not an adequate number of truly scientific research workers to dispose expeditiously of the problem of the pulpless tooth.

4. Until dentistry disposes of its educational problems satisfactorily, and produces a dentist with a scientific mind from whose ranks men can be trained for research work in the very beginning of their schooling, can dentistry expect to solve its scientific problems with a facility equal to that shown by the other specialties of medicine in dealing with their problems?

While dentistry is passing through this experimental, evolutionary step, the public needs must be met as regards the question of the pulpless tooth.

Is there a possible solution in the following factors: (1) a frank statement made by investigators each year in agreement as to just what has been scientifically established to date; and (2) from these deductions a scientific, trustworthy policy and method of procedure given to the public and the general practitioner?

Discussion

E. D. Coolidge, Chicago, Ill.: Dr. Sausser, has brought out some good things for us to think about, but takes a rather pessimistic view. The attitude of Hunter was critical, but it proved to be constructive criticism, which is a fine thing. It creates opposition and stimulates activity; and, in the case of mechanical dentistry, undoubtedly did a great deal of good.

It ought not be necessary for us to have a goad to make us do our best, but 90 per cent of human nature requires some stimulus to go beyond its average effort. It is a difficult thing for a person to do his very best all the time.

This paper deals as much with all kinds of dentistry as it does with the treatment of root canals, and the same can be said for any department in dentistry. Dr. Sausser makes the statement that dentistry is essential to the general scheme of preventive medicine and is fully expected to take its normal place. I believe dentistry has taken its normal place. I am optimistic. I don't like to feel that we are lagging far behind. I don't think we are. I believe it is just as much up to the medical profession to keep on their toes as it is up to the dental profession.

That doesn't mean that our position is any easier; it means it is just a little harder to maintain what we have already reached, and we must look farther ahead. Dr. Sausser points out that the dentist cannot meet the requirements of today. I don't know that I quite agree with that. I believe the dentist of today has in him the possibility of meeting any demand that comes upon him if he will only study that demand and prepare himself for it.

It is true that those of us who graduated a few years ago didn't get the training in the sciences that is being given today by the schools and colleges; we did not get the same kind of course in chemistry, bacteriology and pathology that is given today; but there is nothing to hinder us doing a little reading nothing to hinder us doing a little research work in connection with some university. We don't need to keep ourselves buried in operating all the time.

There isn't a man in the audience but could take a month or two off if necessary and go to some graduate school of dentistry or some university and take a course in general bacteriology, chemistry, physiology and pathology, and it would be well if we did take such a course every year in order to keep up.

I think the same thing can be said in the medical profession, that the course of today is infinitely better than the course of ten years ago, and the man who graduated ten years ago and hasn't kept up with his study is in no better position in regard to medicine and the practice of medicine than is the dentist who graduated ten years ago and has done no further studying in dentistry. So the same thing is true in either case, and I don't like to feel that my profession is lagging so far behind. That is not an excuse, however, that we can rest upon; we must do the work.

Dr. Sausser points out that there is no demarkation in the diagnosis of pulpless teeth, and I doubt if there ever will be. All we can do is to learn what certain conditions stand for and what the possible dangers are that attend such conditions; take into consideration the general health of the patient, and his estimated resistance and use the best judgment we have in regard to the extraction of pulpless teeth. The time will never come when everyone will think exactly alike on this subject, and everybody will agree in the diagnosis of every tooth condition, and it is always going to be impossible to put down a definite rule to go by. I agree with Dr. Sausser that it would be a fine thing if those who are active in any line of research work, or of practice, would try to get a certain number of rules that they all could subscribe to, and follow. It is quite confusing to the aver-

age practitioner who must do most of the work of root-canal treatment to listen to ten or twelve different men only to find that none of them agrees with the others on any point, and as a result of this difference of opinion of the leaders, the listener might think that what he is doing is just as good as what any one of the ten or twelve has advised. It would be helpful if there could be a summing up, but that is a difficult thing.

As for what Dr. Sausser states in regard to research work, there is just as much of an opportunity in dentistry as in medicine for research work, and research work is going on, but it takes years to produce results in research work. A man must shape his life for research work and he must be protected, as was brought out in the meeting of the House of Delegates yesterday, by feeling that if he prepares himself for a life of research work, there will always be employment for him in research work. We are moving along that line fairly well now and I am sure more results are to be accomplished in the next ten years than have been in the last ten years.

Dr. Sausser says that in its present status root-canal therapy is not suited to meet the urgent demand of the public today. I think it is. I believe we are doing more service in root-canal work today than was ever done before. Without any doubt, the worst teeth are being extracted, which is right, and, without any doubt most of those who treat root-canals are doing the work better than they did five years ago.

Some extract too many teeth and I believe others are not so careful as they should be in their technic as regard asepsis and the care with which they fill root canals, but I believe that the work is better on the average.

His statement, "Until dentistry disposes of its educational problems satisfactorily and produces a dentist with a scientific mind, etc.," I don't quite understand. Perhaps it is an insinuation that the schools are not doing their duty, but I would like to say for the schools that I believe most of them are doing the very best that can be done at the present time. I don't know of a single school that isn't doing the very best it can in educating the student in regard to infections from faulty root-canal operations and I believe every one of them is also giving good instruction in the technic of treating and filling root canals.

The paper is constructive even though pessimistic, and I believe it will call out from all those who have heard it and those who may read it that little feeling of resistance which will be beneficial in bringing out better root-canal work because of the pride which the operator will take in his own work, and so it will prove a real contribution to this problem of root-canal treatment.

Edouard M. Hall, Kansas City, Mo.: I think the title of Dr. Sausser's paper should be, "A Consideration of the Problem of the Pulpless Tooth," not of root-canal therapy but of the problem as a whole, as his paper deals with it from that aspect, making no mention of therapeutic agents. Somebody compared this root-canal problem to a big ship tied with a rather long anchor line to the fore, and every tide that comes in comes up against it and you get a bump, and then it goes out and comes back and you get another bump. I am in accord with the general sentiments expressed by Dr. Sausser.

In my root-canal work I have been willing to do anything within my power. But I have met groups less hopeful than those with whom Dr. Coolidge has come in contact, and Dr. Sausser hasn't told half the sad truth. Dr. Coolidge believes everyone is doing his very best, but I believe there is only one in a hundred doing his best when it comes to root-canal work.

Let us be frank and look truth straight in the face. As a profession, we are not doing our best in root-canal work and I can prove it. Dr. Arthur Black has been out in Kansas City and warned us against the evils of arsenical devitalization and heroic drug therapy. Carl Grove has done the same thing, so has Dr. Coolidge and many others. There is not a great deal of disagreement among men who have been doing intensive work in this field. The trouble is that we express ourselves differently and it causes confusion, just as Dr. Sausser says.

An effort should be made to state frankly the opinions of investigators that are in agreement in such a simple and direct manner that every man in the dental profession could understand. For example: Shall any dentist be justified in devitalizing a pulp with arsenic? I believe the answer should be "no," and yet I firmly believe that ninety-nine pulps today are devitalized with arsenic to one taken out any other way.

I, like Dr. Coolidge, believe that Dr. Sausser takes too morose an attitude on the preparation and ability of men in the dental profession. Too highly trained specialization in bacteriology and pathology, in my observation, gives one a morbid aspect. Enough biologic study to give a better understanding and more respect for zoologic and biologic principles and less ambition to pack some heroic germicide into a tooth and expect it to destroy only bacteria and keep the tooth healthy ever after would be of some help.

HOW CLOSE CAN WE COME TO ASEPSIS?

By FREDERICK F. MOLT, D.D.S., Chicago, Illinois

(Read at the annual meeting of the American Society of Oral Surgeons and Exodontists, Dallas, Texas, November 5-8, 1924)

UP TO the year 1860, surgery and sepsis were practically synonymous. Surgical procedures, accomplished as they were without the use of anesthetics, could not of necessity be done with the greatest care, for the time element was the chief factor in success. In consequence, pyemia, septicemia, erysipelas and hospital gangrene were the rule rather than the exception. Surgery was confined practically to amputations, with thoracic and abdominal operations almost unknown.

While at this period such infections were accepted as inevitable, the advancing years saw the beginning of efforts toward antiseptic surgery. Undoubtedly, to the great English surgeon, Joseph Lister, later Baron Lister, is due the greatest amount of credit for the development of our present day surgery. As with all "discoveries," however, his was the development of ideas based upon previous findings and upon the work of contemporaries, and, as always, others were found to have been working along parallel lines. This in no measure detracts from the honor due him for his tireless efforts to conquer disease and for the widespread dissemination of the knowledge gained thereby.

The great French chemist, Louis Pasteur, whose energetic nature is expressed in his motto "Ambition, work and success are the three things that make life," laid the foundation for Lister's later work and our present day knowledge of micro-organisms, by his chemical experimentation. From his studies of putrefaction in beer and wine, and by applying the exact scientific methods of the chemist, he determined that disease, whether in the vegetable or the animal subject, was due to the presence of minute organisms and that, with these excluded, there was no putrefactive change.

Lord Lister, impressed by these discoveries, and having long sought in his surgical work to avoid the septic disease that made surgery a thing to be dreaded, gradually developed the *antiseptic* methods of procedure that have eventuated in our present day *aseptic* surgery.

The work of Semmelweiss, a Hungarian physician, undoubtedly antedated that of Lister, for as early as 1847, by insisting that students working in the maternity hospital use chlorinated lime for washing before going into the lying-in wards, he was able to reduce the mortality from puerperal fever from 12 to practically 1 per cent. His work received little recognition, however, even among his own countrymen, and though by 1856 he had been able to reduce the rate to a fraction of 1 per cent, he died in 1865, himself suffer-

ing from a septic wound incurred during dissection, and without his successes being acknowledged. Our own Oliver Wendell Holmes contemporaneously advocated the same precautionary methods.

Lord Lister's preliminary efforts in antiseptic surgery consisted in the use of pure phenol in wounds and, at a later date, the spraying of a dilution of this antiseptic into the air to do away with the organisms present. His experiments continued during the seventies, with an announcement of progress in 1881, at the London Congress. Not until 1890, at the Berlin Congress, were any certain methods prescribed, so we see how comparatively recent has been the advent of present day surgery.

Lister was the first to differentiate between different types of surgery—a classification that still stands: (1) recently infected compound injuries; (2) cases of suppuration, and (3) clean operative cases. In addition to swabbing out the wound with phenol before and during an operation, a covering of lint soaked in the same medicament protected the operated area during healing. Instruments were phenolized and the patient's skin and surgeon's hands were sterilized by the use of a 1 to 20 phenol solution with a minute quantity of mercuric chlorid.

In present day surgery sterilization by heat has replaced the use of chemical antiseptics whenever possible. The spraying of the air has been discarded as unnecessary, and the use of antiseptics in tissue is confined to those already infected.

Antiseptic surgery, therefore, has given away, in a measure, to aseptic surgery, which we may describe as surgery free from all bacteria. It is still a combination, however, of antisepsis and asepsis. To achieve this type of work, precautionary procedures must be taken: (1) preoperative, (2) operative and (3) postoperative.

Preoperative preparations consist of rendering sterile and maintaining in that condition all surgical materials and instruments that are to come into contact with the wound or to be touched by the "sterile" hands of the surgeon and his assistants. Conversely, any part of the surgeon's body or that of the assistant's that is to come in contact with the wound or the "sterile" surgical materials or instruments must be rendered sterile and kept so. Preferably, the outer clothing should be sterile as well, hands covered with sterile gloves and the mouth and head covered.

The portion of the patient that is to be operated on is rendered sterile by the use of antiseptics, while the remainder of the body is covered with sterile sheets.

The operative precautions consist of care on the part of the operator not to touch anything not sterile and the avoidance of contamination resulting from one not sterile touching sterile materials or instruments or the wound.

The postoperative efforts to avoid infection comprise the use of sterile or antiseptic dressings, avoidance of contaminating contacts and the use of sterile irrigations, if necessary.

This constitutes a rigid aseptic technic. It applies to interference in already infected wounds as well as to clean wounds. How does the dental profession rate as regards such precautions?

The time is not far past when the "doctor" having to incise an abscess was wont to whet his knife on the sole of his boot. The barber who used to do the tooth-pulling probably took as aseptic care of his instruments as he

does of those he uses in the present day. Precedent, however, cannot remain our fetish, and the absence of precautionary efforts on the part of our forefathers in dentistry does not excuse carelessness in the present day. No argument based upon the assertion that no precautions used to be necessary will hold water. As definite an aseptic chain as has been outlined here for general surgery should be our constant aim, and every possible break guarded against.

At the meeting in New Orleans, one of our most capable oral surgeons was scheduled to give a surgical clinic on the removal of an impacted lower third molar. Being a skilled, conscientious surgeon, this operator had followed through the invariable routine of preparation as rigidly as if he were going to open an abdomen. When the case was presented, it was not the difficult impaction that had been expected but one comparatively simple. Much criticism was voiced by the spectators regarding the extent of preparation and the simplicity of the operation necessary. The surgeon was right and the spectators were wrong. No physician trained in major surgery could have found any point to criticise, and how infinitely better and safer was his preparation than that usually indulged in of tumbling out a group of instruments of dubious sterility, putting on a gown, probably clean but not sterile, washing the hands and going to work.

The argument is brought forth that precautions are unnecessary because the mouth is already filled with micro-organisms. It is, but how absolutely foolish it is to advance such a point. It is further contended that the mouth tissues cannot be so cleansed that contamination will not occur. That is not true. It is difficult but possible to so cleanse the oral tissues that the portion to be worked on is surgically clean. The added argument that the tooth to be operated on may already be infected has no bearing, as the contamination in an existing infection, from another type of organism, may present the most dangerous possibilities.

In desperation, the argument is put forth that despite lack of care and knowledge on the part of our dental fathers the patient invariably recovered. This may be answered by expressing a doubt as to the proportion of recoveries and congratulating the dental profession on having a highly vascular and resistant portion of the body entity on which to work, and on having as well the obvious protection of the Deity; otherwise, we would not have gotten by. Nevertheless, when we consider that probably not more than one-tenth of the syphilitic cases that we work on are recognized and that the negative Wassermann is valueless, it gives us, as the French say, "to think."

Surgery in the mouth differs not one whit in its essential principles from the surgery of any other part of the body. The simple extraction of a tooth may be surgery as much as the removal of a cyst or the repair of a cleft palate or a tonsillectomy. No carelessness regarding cleanliness should be tolerated. The intelligent laity are our greatest watch dogs, and they have been responsible quite as much as any other one factor for whatever effort we have put forth. If the dentist is fortunate enough to have been fitted out with an elaborate sterilizing room, let him, for the profession's sake, use it. No dentist devoting his practice to surgery, moreover, or attempting to accomplish surgical procedures in connection with

his general practice should be without a complete sterilizing equipment, including an autoclave.

The average untrained office assistant has a rather vague conception of asepsis. A napkin fresh from the laundry may be clean without being surgically clean, as may the top of an operating table, or the assistant's hands. Hospital training surely emphasizes the difference, and therein lies one of the best reasons for employing a hospital-trained nurse where surgical work is done. The medical knowledge acquired is of immense value, of course, but the one point of difference always apparent in the work of the graduate nurse as compared with the intelligent untrained assistant is in the matter of asepsis.

The dentist himself all too frequently lacks training in surgical operating room procedures. It is a bit of instruction that might well be worked into both the course on pathology and that on surgery in every school, for nothing is more tragic or more conducive to the superiority complex of the physician as regards the dentist than to watch him, utterly lost, trying to adapt himself to something quite new—the modus operandi of preparing himself and his instruments for surgical work. So frequently is the dentist in either a large or a small community called on to collaborate with the surgeon, or to operate in the hospital, that this ability to be at home in the operating amphitheater is of inestimable value. Nothing would seem to detract more from a man's self-respect than to have an undergraduate nurse smiling pityingly at his ineffectual efforts.

If it is of importance to the general practitioner, it is of infinitely greater value to the specialist to be familiar with such procedures. Not only this, but he should apply the same principles to his office work in *every possible degree.* Some offices are designed along hospital operating room lines and some quite the contrary. The simpler the room, the less the amount of woodwork and the fewer the pieces of equipment standing on the floor, the greater will be the facilities for cleanliness—the salient feature. Walls should be of such nature as to permit of frequent washing down. Floors should be scrubbed with soap and water at least once a day. Lavatories should permit of our turning water on and off with foot or knee control.

Quite naturally, we cannot assume to change the clothing of the patients who come to us day by day, but we can cover them with sterile sheets or towels. These towels and sheets, first covered with muslin, are run through the autoclave. This type of sterilization provides pressure and temperature sufficient to penetrate and sterilize completely in a short time, besides leaving the sterile materials dry. The usual method of sterilization calls for fifteen to twenty minutes and 15 pounds' pressure.

Metal instruments after use should be scrubbed in cold water and sterilized by boiling from fifteen to twenty minutes in water containing 1 per cent of crystalline washing soda, which assists in cleansing the instruments, raising the boiling point of the water and avoiding rusting. Instruments should be put into boiling water, not into cold water and brought to a boil, and should be completely covered. They are better wrapped in a towel and placed in the basket in the sterilizer. After sterilizing, they should be carefully dried. If dull or rusty, a paste of alcohol and

"Bon Ami" may be used to polish them, and then they are resterilized. Jointed instruments are oiled with petrolatum. Cutting instruments may be sterilized as above, but repeated boiling destroys the temper. They may be sterilized in the autoclave or be placed for five minutes in phenol or compound solution of cresol (lysol) and then transferred to alcohol. Absolute alcohol alone may be used for their sterilization as well as the sterilization of knives, which should have the cutting edge covered with cotton. Needles are stuck through gauze and sterilized.

Gloves are sterilized in the autoclave. They are washed in cold water after use, dried and powdered inside and out (which may be done by shaking them in a box with talcum powder and turning them inside out). Each pair is wrapped in gauze or muslin and dry sterilized for forty-five minutes at 15 pounds.

Engine handpieces are washed with compound solution of cresol and alcohol and covered with a sterile cloth. Surgical drills are boiled.

Dressings and sponges used may be of different types, and three sizes are suggested. Flat fold gauze is used for Nos. 1 and 2. A 100 yard bolt may be quickly cut and put into piles of pieces, size 8 by 18 inches for No. 1, and 12 by 12 inches for No. 2. No. 1 is folded with edges in, and twice one way, then doubled; No. 2, with all edges in, and twice each way. No. 1 is used for packing the throat, to prevent both mouth breathing and the inspiration of tooth, bone and filling particles during operation. No. 2 may be used for sponging or for packing under the tongue. No. 3 sponges are designed only for drying the wound during operation and are made by cutting No. 2 J. and J. 6 inch cotton rolls into short diagonal sections. These make ideal sponges and are simply prepared. Sponges of sizes Nos. 1 and 2 are placed in packages, wrapped in muslin and sterilized in the autoclave. A handful of No. 3 sponges are wrapped in gauze and sterilized. Applicators are made by wrapping the end of applicator sticks in cotton. These are put up in bundles in gauze and sterilized.

Glass syringes are sterilized by removing the piston, placing both parts in gauze in warm water and bringing to a boil. Needles are boiled with the wires in them. Preparation dishes for boiling solutions are also boiled. Needles after boiling may be kept in gauze in a sterile Petri dish.

Just how long any of these materials will remain sterile is dependent on their handling. If sterile instruments are handled with sterile instrument forceps, laid on sterile towels and covered securely with other sterile towels, it will be safe to use them after a considerable interval. If these same sterile instruments are picked up with hands *not* sterile, placed on unsterile shelves or in drawers or on racks and left there uncovered, they are not only already contaminated but will continue to be more so every minute. This is what is done with dental instruments almost invariably, and what happens in many cases with forceps, elevators and cutting instruments. In such a case, all instruments to be used should be resterilized before use.

Even hand brushes, which are so generally allowed to lie about reeking with infection, should be washed and either boiled or dry sterilized.

Either we are going in for sterile work or we are not. If we are, a correlation of all these various procedures must be accomplished; if not, we will

adhere to the time honored procedure of "pulling" teeth.

Anything more than this process becomes surgery. If, in trying to get a broken-off root, we carry through that obsolescent method of running one beak of the forceps up under (or over) the mucoperiosteum and cutting through to the root, we are doing surgery of a kind. If, in using an elevator, we go through or under the soft tissues or into the socket, we are doing surgery. If we go into a socket or infected area to curet, we are doing surgery; for we are entering bony structures, and bone surgery calls for the most meticulous aseptic care of them all. How difficult then to draw a line of demarkation!

The bringing together of all these aseptic procedures, then, for such a bone surgery operation as the removal of an impacted mandibular third molar would necessitate the patient's being seated and draped with a sterile sheet, and towels, and with head covered with a sterile towel.

The operator, in the meantime, has scrubbed his hands with a sterile brush, washed them in compound solution of cresol (diluted) or mercuric chlorid and donned sterile gloves and gown.

The instruments have been sterilized, properly laid out on sterile towels on the tables and covered with other sterile towels.

Packages of sponges or one packet containing towels and both types of sponges, which have all been sterilized, are laid out. Alcohol jars and jars containing sutures dipped in the compound solution of cresol (diluted) are put on the sterile sheet.

The assistant has cleansed her hands and donned gloves and is ready to proceed.

The patient's face is washed with 70 per cent alcohol, which, besides cleansing and sterilizing, washes out the fat particles in the skin. A mustache is very thoroughly washed. The mouth, previously rinsed with an antiseptic solution, is dried by sponging, the portion to be worked on being blocked off by placing sponges. This area, including all surfaces of teeth as well as all adjacent areas, is painted twice thoroughly with a 3 per cent solution of iodin.

Regardless of operative problem or methods, the operation proceeds from this point with but two things to be accomplished: the successful completion of the operation as regards technic, and the careful adherence to all rules of surgical practice. There need be no culpable breaks in the aseptic chain if all materials to be used are sterile and nothing is touched that is otherwise. If any break should occur, as, for instance, the assistant's touching an unsterile object or the surgeon picking up an unsterile instrument this may be remedied by cleansing the hands with the compound solution of cresol or bichlorid solution always at hand. If the break is not then remedied, the whole chain is irreparably lost. With a distinct conception of the meaning of asepsis, a careful preparation for our work to avoid requisitioning additional instruments and a meticulous maintenance of sterile field and sterile working materials, there is no reason why, in our work, we cannot adhere as thoroughly to the rules of surgical cleanliness as it is possible to do in abdominal surgery. To fall short of this is to lay ourselves open to criticism.

DISCUSSION

Boyd S. Gardner, Rochester, Minn.: I should like to refer briefly to the necessity of protecting our patients from infection when dental films are being exposed by the

roentgen ray. We have found it necessary for our roentgen-ray technicians to make use of rubber gloves in order to protect the patients as well as themselves. In the interval between cases, we also require them to wipe all parts of the roentgen-ray equipment that are touched by them, with 40 per cent alcohol. Dr. Carl Lucas gave the clinic at New Orleans to which Dr. Molt has made reference. He has done more, from the standpoint of a dentist, to bring to our attention the necessity of being clean in our work than any other member of our profession.

Earle H. Thomas, Chicago, Ill.: Dr. Molt carries out in his own office everything that he has told us along the line of keeping surgically clean. Now we can't be ideally surgically clean around the mouth, but we can work as close to that ideal as possible. Papers like this stimulate us to think over the routine that we carry out in our offices and possibly be a little more careful than we were before. If each time we hear a paper like this we do just a little better, we will presently be approaching the ideal and will be giving better service to our patients. Dr. Molt asks one question in his paper: How does the dental profession rate as regards asepsis? I would answer it this way: The dental profession rates over 1,000 per cent better than it did ten years ago, and it is continuing to rate higher every day. It is just such papers as this that stimulate us to rate higher and higher towards this ideal. There are two or three places around the office where most of us can be a little bit more aseptic. Dr. Molt said in his paper the wash bowl should be governed by foot control or a knee control. One of the easiest ways of transferring infection from one patient to another is to work on a patient who has Vincent's infection, wash at the wash bowl, turn on the water with hands covered with germs, dismiss the patient, have the next patient come in, walk over to the wash bowl and put your hand on the handle of the faucet to turn on the water again, etc. If there is any one place where we want to be careful, it is in transferring infection from one patient to another. If we want to fall down in our technic a little, let us fall down in just the ordinary bacteria that we run across in the atmosphere, but not in procedures affecting our patients. We all know that any bacteria that have undergone animal plantation, or, in other words, have been living on the tissues of the patient, have become many times more virulent than if they had been propagating in the air or on a shelf somewhere. The former are the organisms we primarily want to prevent transferring from one patient to another. We ought to be especially careful not to transfer syphilis, because the percentage of those affected is so high. We certainly must be very careful not to transfer this infection from one patient to another. Another condition that is common is Vincent's infection, and certainly when we deal with such virulent bacteria we should be very careful about sterilizing everything that has been touched in handling that patient.

Theodor Blum, New York City: Men coming into our clinic for the first time haven't the slightest idea as to how to keep themselves and their instruments clean. They work with wrist watches and rings on. We have nothing to be ashamed of when we compare ourselves with physicians as regards asepsis of technic. I am not speaking of surgeons—they know how to keep themselves clean, but the physicians themselves are not careful. Considering their medical education, they are not so clean in their work as dentists are in theirs, and I speak from experience because I have had occasion to watch both. One of my children was taken to one of the best pediatricians in New York for some ailment. He looked into the child's mouth and thought a tooth was erupting or nearly erupting. He took a handkerchief out of his pocket, wrapped it around his finger and pressed it on the gum to make the tooth cut through.

Walter Barry, Newark, N. J.: I look at the question of asepsis from the point of view of the exodontist. We sterilize our hands as well as possible between cases. We sterilize gauze and instruments. The question of sterilizing instruments for each individual operation just before we use them can be taken care of, and we do not get many infections either; but when it comes to draping the patients and taking all the precautions that should be taken in order to prepare the patient thoroughly in a surgical way, it is absolutely impossible.

I cannot see how any exodontist in a busy practice could approach anything like that degree of asepsis. Probably Dr. Molt can do it in his practice if he can procure fees commensurate with that sort of service, but we cannot do it because our patients cannot afford to pay the fees it would be necessary to charge, and I doubt if many exodontists can get fees that will permit them to follow such a technic. Leaving out the economic side of the question I think the technic is highly commendable.

W. B. Amy, Toronto, Canada: I am here to check upon myself and not on somebody else, and I find that in a great many cases I need checking up very badly. To the man who says that he would sterilize the mouth perfectly I would say it is impossible. There still is infection there, in spite of the use of iodin or other treatment. The general trend of this article is exactly what we want. We should approach asepsis as nearly as we possibly can and not excuse ourselves because we are lax in some links of the chain. I am not saying we reach as near perfection in Canada as some of your men do in this country. As Dr. Thomas has said, it is a mighty fine thing to approach as nearly the ideal as we can.

Dr. Molt (closing): I shouldn't take too seriously what Dr. Barry says because he and Dr. Davidson have the most completely equipped office for the practice of our specialty that it has ever been my pleasure to see. Dr. Barry, incidentally, quite proved my case by saying that with the exception of changing their gowns they did everything that I recommended. This is a case of picking out one little point to dwell on. You can readily draw a line of demarkation between the type of cases that require the most complete and comprehensive, most meticulous attention to surgical detail and those that are exodontia cases pure and simple, just a matter of extraction of a tooth without any surgical features, unless, as I say, we consider every extraction surgery. Quite naturally, everyone of us has intelligence enough to interpret the suggestions here with regard to the severity of the operation and the requirements that appertain thereto. The introduction that I made pointed the very need for such a paper (the fact that I was handling a case which had been mishandled by someone who should have known better, and which might have eventuated in a malpractice suit for the dentist). It is, however, not this individual case that demands our consideration, but the fact that, day after day and week after week, we have brought before us the evidence that dentists are not sufficiently grounded in the rules of surgical asepsis. Dr. Blum's statement is probably correct. There are many physicians as well as dentists that are careless. The points that I have brought out are not original with me; they are simply put before you so that they may be carried to the men who have not had our experience; for if it is important in our work, it is important in the work of the general practitioner as well.

REASONS FOR THE EXISTENCE OF AN ORTHODONTIC SPECIALTY

By T. G. DUCKWORTH, D.D.S., San Antonio, Texas

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

ANY specialty is a matter of evolution; therefore, time is the most important factor. It is only logical that the orthodontist's views must be altered and sometimes reversed, in an effort to learn what is best in serving his patients.

What was taught ten years ago and what is being taught today is quite different, notwithstanding many problems have not been solved and many questions have not been reopened that do not seem to be adequately answered. The greatest progress has probably been along the lines of appliances and the care that is being given to the teeth and adjacent structures during the time the cases are under treatment. Bone surgeons have made miraculous progress in the treatment of bone disease and in the control of bone regeneration, which has added light to our subject. We, as orthodontists, have ceased to reason that we are interested only in the mouth. We cannot but consider the general scheme of things and interest ourselves in metabolism, as the mouth is a part of and not separate and distinct from the rest of the body.

The endocrinologist is giving us the benefit of his research, and this in itself may prove a big factor in the solution of many of our problems.

I do not believe there is anyone in the medical or the dental profession who will question the fundamental aims of the orthodontist. They are all as interested in the proper placing of badly erupted teeth and in the correction of malformed jaws as we are, and what difference of opinion that may exist can only concern the means employed in the accomplishment of the common ideal.

At this instant, we are faced with the problem of deciding whether orthodontic interference will be beneficial to the patient or will be detrimental. Not infrequently, we are compelled to remove regulating appliances that systemic disturbances may not be aggravated during spells of illness, and for the same reason we would not be justified in adjusting appliances for anyone not in good health. Most of our patients come to us not because they want to, but because they must. The condition of the month in most instances warrants the relief of established pathologic conditions, and this means that we are handicapped at the start in that we must fight to prevent caries, pyor-

rhea and the possibility of an induced infection into the system as a result of collection of débris around the teeth and the appliances.

The difficulties met with in the practice of orthodontia are not to be minimized; nor are the results or possibilities for better results to be disregarded; for there are thousands of children that can be made infinitely better and happier if the work can be extended so as to include many more than are now being cared for. The existence of an orthodontic specialty was made possible by the early pioneers who were brave enough to cut themselves away from general practice and give their entire time and attention to orthodontia. If it were not for the men who first specialized in this work and who fought for the principles they thought to be right, the specialty would not have made such a rapid advance from its infancy, about twenty years ago, up to the present time. There is quite a contrast in the practice of orthodontia in this country and in Europe, due probably to the unfortunate conditions existent in European countries in the past ten years. With many thousands of children demanding the services of the orthodontist, the status of orthodontia in Europe must change. Many more men must take up the work and foster the cause through organized societies for the advancement of the work as a specialty. Many of the smaller cities in this country will support an orthodontist well, as one does not have to depend on the population of the city itself for the patients, who are willing to come many miles if the service is offered them. The public has been educated to the necessity for the work, which has made possible openings once thought impossible for one to make a living by giving his entire attention to the specialty.

A great deal has been said in the past years about educating the public on orthodontic matters, and this has been necessary; but I believe that from now on, we will have to give some attention to caring for the demands made on us, as the public is susceptible and appreciate very much what is being done for them generally in an orthodontic way. It was once stated by an eminent orthodontist that the correction of irregularities of the teeth was largely a matter of pleasing the patient. This may be true to a certain extent, but our responsibility to our patient should go a step or two farther in that we should always assure the patient more than mere satisfaction with the results. There are limitations in many cases in which we are confronted with facts and not theories that prevent us from even pleasing the patient; at the same time, a great deal has been done to improve conditions.

To what extent are we justified in carrying a case to a point of perfection when the masses are to be considered, and with the uncertainty of maintaining an ideal occlusion indefinitely? This no doubt would be answered differently by different men, depending on circumstances surrounding the individual case and the number of patients to be treated. In a general way, I believe that it is better to be satisfied with a little less than what is ordinarily considered ideal, and care for more patients, as the ultimate results will not be far apart, and

more children will have been cared for.

The views on orthodontic matters are getting to be much more flexible as regards treatment as well as regards fees; which is bound to reflect a great deal of good to all concerned. The fee question is becoming more stabilized, and in a few years, the large fee for one patient and the small fee for another will be averaged in such a way as not to show such a contrast in the charge for what is apparently identical work.

The importance of a specialty depends on the amount of good that is being done in the field, and if we are not doing the good that we should, it is not because we have not had the opportunity. Orthodontia as well as general dentistry began as a science, but became a mechanical and artistic profession, which is now endeavoring to return to a science. In fact, we no longer attempt to regulate cases, at the same time looking on the procedure as a gamble; the work is more or less clean cut, and anyone contemplating entering the specialty who formerly would have considered his success doubtful would not hesitate to do so now.

The men who devote their time to cleft palate work should be among the most appreciated people that the world knows today, and when we consider that the final results of a cleft palate case depend on the orthodontist, we realize our responsibility to these unfortunate people. There is no better or surer way in which the results of our work can be made manifest than in assisting in the correction of these cases. They are pitiful because they exist from birth, and anything that can be accomplished for an infant should have the right of way in the heart of any well meaning person. This of course is only one type of condition that we meet, but the impression it makes on those who see the cases is one of relief.

Orthodontia is more than a department of dentistry; it is a science that involves physiology, hygiene, medicine and surgery. Irregular teeth or teeth that are out of normal relation to each other not only tend to decay, but because of their abnormal positions form protected areas for the colonization of micro-organisms; which adds greatly to the individual's susceptibility to disease. The aim and object of orthodontia has been very ably expressed by Dr. Ralph Waldron:[1] "to make growth more perfect, decay less rapid, form more beautiful, living more enjoyable, life more vigorous, and death more remote." Services rendered to humanity should be above the level of mere theory; in other words, theory and practical technic should be so correlated that one branch of our science is not overstressed at the expense of the other. To attribute lack of bone growth to functional deficiency of the pituitary gland is merely speculation, and anyone who raises false hopes in his mind and those of his patients by the administering of extracts of the ductless glands as a curative agent is doubtless doomed to failure. I cannot see how we will be able to accomplish anything through the administration of therapeutic agents except indirectly, and as a matter of prevention.

1. Waldron, Ralph: President's Address before The American Society of Orthodontia, October, 1924, p. 599.

There are many factors of a local nature to be considered. Our mode of living is such as to retard functional stimulus, which is necessary for the proper development of the arches, and we are forced to resort to any useful adjunct that will aid us in the correction of these conditions. We were once of the opinion that bone development took place in direct proportion to the skill of the operator and the nicety of technic and efficiency of the appliance; but failures have convinced us otherwise, and as we develop in the knowledge of orthodontia, we realize more and more that we are dealing with a biologic problem, involving many unseen and unknown forces, and that only by research and an exchange of ideas with those interested in correlated sciences can we hope to master the situation.

We have been able largely to dispel the popular conception of orthodontia, which seems to be centered on the procedure of correction of malposed teeth by simple mechanics. The uninformed are still of the opinion that malposed teeth are only slightly abnormal deviations, the correction of which requires but little mental effort and skill.

As one pursues the study and practice of orthodontia, he realizes more and more that so-called simple conditions are frequently complex; that time, effort and expense may be wasted because of consideration directed to the tooth or teeth only and to the simple mechanical means for so-called correction, while no account is taken of many factors responsible for the malocclusion.

I am optimistic as to the outlook and progress of orthodontia generally. It means much to preventive medicine, but I doubt if it will ever mean much as a preventive specialty.

DISCUSSION

Abram Hoffman, Buffalo, N. Y.: I was interested in Dr. Duckworth's remark that may be misunderstood as being in favor of letting down in the standard of our work so as to enable us to take care of more children. Orthodontists of the larger cities are as a rule very busy, and there is certainly a crying need for more men in the practice of orthodontia; but, in our effort to take care of a greater number of children, it would be a mistake to offer any suggestions for a letting down in the quality or standard of our work. I hope the time is not far distant when more children can have the benefits of orthodontic treatment, for, as we all know, the children of our nation are sorely in need of it. A few years ago, I think it was in 1920, at Atlantic City, Dr. Kemple gave us a paper in which this same subject was touched on, and in the American Society of Orthodontists there was a free discussion of this particular point. I am sure Dr. Duckworth is not recommending a letting down in the standards of practice in one's desire to care for more patients.

Martin Dewey, New York City: Dr. Hoffman's remarks seem to me to substantiate what Dr. Duckworth said, because of certain conditions coming to my attention in the past few months; i. e., the need for proper knowledge going to the profession in regard to orthodontic standards as related to results. Some of you may have noticed that the editor of a dental journal of wide circulation commended an article because the writer recommended the extraction of the first permanent molar as a solution for orthodontic problems, etc. It seemed to me that the writer of the article and the editor of the journal were going back many years, as far as orthodontic standards and results were concerned, since many of us who have studied a large number of cases know that the surest way to produce malocclusion is to extract the first permanent molars. On investigating the origin of the article, it was found that the writer was a general practitioner who based his claims upon the fact

that he had been practicing forty years. As some of you may know, I wrote an editorial discrediting the practice and succeeded in getting a large amount of correspondence from men in the community in which the author of the article resided. They claimed that he was a fine gentleman. I agreed to that, but had to conclude that he did not know much about orthodontia. They said he was connected with a large dental school for a number of years. I replied that was all the more unfortunate. Such experiences show all the more reason for the orthodontic specialty. We must not only treat malocclusion, but also convey information to the profession and to the public showing that orthodontia has a certain standard, and that any short cut that will enable the orthodontist to take care of a large number of cases, such as the extracting of first permanent molars, etc., is faulty. It seems to me our necessity for existing as a section becomes more and more important as we proceed from year to year.

Oscar E. Busby, Dallas, Texas: Dr. Duckworth states that the appreciation of orthodontia is based largely upon the character of work hitherto accomplished. The proportionate number of cases which have been treated must assuredly have been successfully treated; otherwise, this appreciation of which he speaks would not be so much in evidence. The orthodontists in Dallas and other cities through Texas have to do most of their work after school hours or on Saturdays. The teachers and superintendents are almost arbitrary in the matter, regardless of how hideous the deformity of the child may be or how much work is needed. They say it is impossible to excuse a child during school hours. I believe we should endeavor to secure the cooperation of the teachers and superintendent, and inculcate the truth in their hearts and minds that they cannot successfully educate children that are not physically well. I trust we may be able to get the board of health and board of education to cooperate with us in this matter.

W. E. Flesher, Oklahoma City, Okla.: I took up with our school authorities the matter referred to by Dr. Busby. I asked if it would not be possible to have a child excused when absolutely necessary, without loss of time or discredits. Our superintendent said that at any time I saw fit to have a child so excused he would authorize the teacher to let him go.

William C. Fisher, New York City: How we can care for more children is a serious problem. I do not believe there is any specialty of medicine or dentistry whose members have so much waste daylight time as the orthodontist. I do not mean to say the individual orthodontist does not apply that time profitably to himself, but I am speaking of the daylight time in which he might be treating children. Some men have solved the problem. One I know handles it as follows: He makes an estimate for a case. The parents may say in conference: "Doctor, we are anxious to do everything we can for the child, but the fee is a little more than we feel we can possibly take care of. Is it not possible for you to reduce this fee? To which he replies: "Yes, there is a way. My morning hours, particularly from 9 to 11 are not full. It is very hard for me to fill them. I will make a 25 per cent reduction on the initial payment, or even 50 per cent reduction on the initial payment and 25 per cent reduction on monthly payments provided you will go to the superintendent of schools and have the teacher select a morning in the week when this child can come to my office at 9 o'clock, and report to the school at 9:45." My friend informs me he has been able practically to keep busy during the early part of the day since he instituted that system two or three years ago. This plan can be worked out in the smaller cities, although it may be difficult where the transportation requires long periods of time.

Frederick B. Noyes, Chicago, Ill.: There are two factors that determine how often a patient will have to go to the orthodontist. The first is how definitely the operator knows what he wants to do. The second is the positiveness and certainty with which the appliance he is using will do what he wishes it to do. When I began the practice of orthodontia, I was treating all of my patients twice a week. Why? Because I was using an appliance that would not stay in adjustment for more than that length of time. As soon as the teeth had moved as much as the adjustment produced, the ligature would slip off, and in the last three days of the week the movement of the first

three days was lost. Consequently, in order to keep an appliance operating, it was necessary to see the patient twice a week, and I am perfectly frank to say I did not dare go much longer for fear something undesirable would happen. I did not know enough about what I was trying to do. In fact, once in a while something would happen through a patient failing to come to the office for three or four weeks. At the present time, I see most of my patients once a month, none of them oftener than once in two weeks. I came to the once a month arrangement, because I found that those living so far away that I could not see them oftener got through faster than the patients I saw once in two weeks. I have said to patients many times that the reason for this is that we have appliances that remain in adjustment better than the old ones and we know better what we want to do than we used to. It is therefore worth a man's while, no matter how difficult it may be to acquire the technic, to use a mechanism that he can depend on to do the thing for which it is adjusted and to stay in adjustment until the patient's return. He will learn, too, that if he makes an erroneous adjustment, the appliance is going to do something that he did not want it to do. In other words, better results are obtained with the mechanism on which he can depend than with a mechanism that has to be watched closely in order to keep it going properly. There is nothing that will increase the capacity of the orthodontist to serve as much as these two things: first, the exact knowledge of what he wants to accomplish, and, second, the mastery of a technic that will give him the certainty that what he wanted to accomplish is going to be accomplished, and nothing else.

Dr. Duckworth (closing): In respect to the number of patients in an orthodontic practice, and also with regard to what I meant by letting down on what we generally term an ideal: I did not mean to convey the idea that we should let down on our technic or our final results, but, as Dr. Noyes brought out, he was seeing his patients twice a week, but is now seeing them every two weeks or once a month; so it has seemed to me the solution of our problem might be along some such line as that. I am finding that true in my own practice.

NATIONAL GOVERNMENT EDUCATES FOR DENTISTRY

By BRIG. GEN. FRANK T. HINES,* Washington, D. C.

MEMBERS of the American Dental Association and readers of THE JOURNAL will be interested to know that the National Government has educated for the dental profession hundreds of men, and that the Government still has in training for this profession many hundreds more.

These men are in training in the leading colleges and universities of the country and are scattered from coast to coast. The chief cities in which this training is given and the number of men being trained as doctors of dentistry in these cities are as follows: Boston, 13; New York, 4; Philadelphia, 35; Washington, D. C., 2; Atlanta, 28; Cincinnati, 11; Chicago, 24; St. Louis, 18; Minneapolis, 44; San Francisco, 36; Los Angeles, 38; Denver, 40.

This educating of men for the dental profession on the part of the National Government is a part of the work of training and educating the soldiers who served in the American Forces during the World War and who received wounds and suffered disabilities that prevented them from working at the occupations at which they worked before the war. This work is now entering upon its last phase and will terminate, June 30, 1926.

The scope of the work of our Government in endeavoring to rehabilitate the disabled soldiers of the World War is realized by few. It has been going on since 1918. A total of 177,823 disabled soldiers have entered on this training and education under the National Government's jurisdiction. These men are from every section of the country and have been trained for almost every conceivable occupation. Some have been enrolled in practically every university, college, and school in the country, while thousands of others have been trained "on the job" in the factories and workshops of the country. More than 92,000 have finished their training and have been declared rehabilitated, and practically all of these have been placed in the kind of employment for which they are trained. Some 25,000 men still remain in training, and, as stated above, several hundreds of these are studying dentistry. A large number of these will be declared rehabilitated and ready for employment in this month of June, following their graduation from schools and colleges.

The National Government's work in connection with the rehabilitating of the disabled soldiers is carried on under the auspices of the United States Veterans Bureau, a separate department of the government directly under the control of the President. Under the Acts

*Director, U. S. Veterans Bureau.

of Congress governing this rehabilitation work, it is expected that the Bureau will train these men for the vocations which they will be able to carry on successfully. When the Bureau completes the training of these so-called "disabled veterans," they are in no sense disabled as far as their ability and usefulness is concerned in carrying on in the specific line of work for which they have been trained. The Government aims to make them able men in their new vocations.

The men that are being trained for the dental profession are students in the best schools of the country. Much thought was given by the Bureau to the previous preparation, ability and suitability of these men for the dental profession before they were permitted to begin their course of study. The Bureau is proud to report that many of its students of dentistry have carried off honor grades in various schools.

It is the duty of the Veterans Bureau, as provided under the Acts of Congress affecting this work, to secure employment for the men whom it has trained. This duty can be performed only through the cooperation of the general public. One of the brightest spots in the work of the United States Veterans Bureau is the marked degree of cooperation that has been shown by the public in taking into employment the thousands of men whom the Government has trained and rehabilitated.

It is especially difficult to find employment for persons that are being trained for the various professions. The Bureau feels certain that it is appealing to a most receptive portion of the general public when it asks the members of the American Dental Association to render cooperation and assistance to the Government in the employment of men whom it has trained for the dental profession.

As the Bureau has branch offices in practically all of the large cities of the United States, effective contact can be made by those interested with any one of these offices. The United States Veterans Bureau, Central Office, Washington, D. C., solicits correspondence and enquiries from members of the dental profession who might consider favorably taking into their offices one or more of these deserving men who are ambitious for success in dentistry.

DEPARTMENT OF DENTAL HEALTH EDUCATION

THE DUTIES OF A HYGIENIST IN THE OFFICE OF A GENERAL PRACTITIONER

By MARY G. NEWBERRY, D.H., Cleveland, Ohio

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

THE care of the mouth and the teaching of oral hygiene to the general public is one of our most important and interesting problems today. It is being placed before many people in many different ways; to the employes in the large industries, children in the schools and the general public, by clinics, lectures, circulars and motion pictures. Literature or information of any kind on this subject has been very scarce, and the greatest effort is now being made to secure this, by the Department of Dental Health Education of the American Dental Association, from which various kinds of literature, data and motion picture reels may be obtained.

The hygienist is playing a large part in the teaching of oral hygiene, especially in the schools where it is in a great many cities becoming a part of the curriculum, and in the factories, in the medical and dental industrial clinics. But very little is said about the hygienist in the office of the general practitioner. Why hasn't she a wonderful chance to render a wonderful service in the same way? She is reaching an intelligent class of people, not necessarily the wealthiest, but the middle class people, who are usually the most interested and anxious to carry our message and who understand and appreciate its importance.

I have been in the office of two general practitioners, each of more than twenty years' experience, for about two years; and the one big idea we try to instil into the minds of our patients, old and young, is the importance of both care of the teeth and of diet in relation to the general health. A patient's work is never completed until a few questions as to kind of toothbrush and dentifrice employed and as to the nature of diet have been asked and satisfactorily answered.

Many dentists believe that the hygienist may overstep her prerogatives; but if she is in earnest, she will not, for she will have enough to do in "selling" this one idea. She is a saleswoman, convincing her patrons, if not by words, by practical demonstration. She must be business-like, having dignity, but with it creating a pleasant atmosphere, with a smile for everyone, not forced, but

real, and showing that she is enthusiastic about her work.

Even in this advanced age, the patient's first thought of the dental office is of fear and discomfort, and this the hygienist may partially, if not wholly overcome. This is especially so with the child. His future attitude depends largely on his first impression; we therefore make it as pleasant as we can. If the children come with their parents, requiring no work, we let them get acquainted with the surroundings. There are so many ways of gaining the confidence of little children. The dentists are busy and frequently lack the time necessary to approach the child properly. Therefore, it is left to the hygienist, and with very few exceptions, perhaps it is because of a motherly instinct, she gains the friendship and confidence of the child. He must not be frightened on his first visit unless it is absolutely necessary. If it is necessary to do much work he should be told in order that there will be no misunderstanding on his part. Cleaning the teeth should not frighten them, and in this way children may become accustomed to the equipment and methods.

There are always story books, with rhymes and pictures, and folders of all kinds pertaining to the teeth, or general health; such as "The Five Little Pigs," published by the Mississippi State Board of Health; "Why the Cow Jumped Over the Moon," published by the National Dairy Council; and "The Ribbon Road," published by tooth paste companies. We see that every child has one.

The older children, we find, behave much better if they come without their parents. Therefore, Saturday is their day, and each one is as brave as a little general. The presence of others of their own age has a marvelous effect on them. Mothers come to us while the children are teething and ask what they can do to give relief. So our influence is felt even before the teeth have erupted.

Prophylactic treatment is given at the second appointment, generally, with the adult. I am speaking now of the new patient; for on his first visit he wants to see the dentist with whom he made the appointment. No one else will do. To dismiss a patient after completed work without planning for future visits is inexcusable. To have a patient report at stated intervals for prophylactic treatment and observation is ideal. The periodic appointment, or recall system, can be made very effective by turning the matter over to the dental hygienist. She may clean the teeth, record all reparative work necessary and make a clear field for the work. Many people do not realize how rapidly time passes, and persons in business especially are glad to be reminded.

When a prophylactic treatment is given, every surface is scaled carefully, all visible deposits being removed. A disclosing solution is then applied which will stain any remaining deposits. After these are removed, the teeth are ready to be polished. We find a fine flour of pumice moistened with peroxid a very satisfactory abrasive. When polishing, the rubbing with the orange wood point seems to have the effect of a massage, and cannot harm in any way. If the engine is necessary, only the rubber disks are used, so the tissues cannot be injured. The interproximal spaces are cleaned thoroughly with a flat dental floss inserted carefully between points of contact so as not to bruise the festooning tissue. This we also advise the patient to do with care at least once a day. The approximal surfaces are polished with

a prepared prophylactic strip and we find that after this treatment the deposits do not recur so rapidly.

An ordinary prophylactic treatment should be completed at one sitting. There are some cases that are exceptions. We have lately had a number of rather young persons come to us, who have been told they have pyorrhea. One patient, a woman about 24 years old, came to us very much alarmed. What could she do? She did have some deposits and her gums were soft and spongy, but after one prophylactic treatment and one week of brushing the teeth, the gums were a healthy pink, and normal.

In the case of Mr. T., sent to us January 16, 1924, the gums were bleeding, and the teeth were loose and extremely sensitive to pressure. At this time a portion of the deposits were removed. January 18, scaling was finished. January 24, the teeth were polished and instructions given for brushing, a soapy paste being recommended. January 31, a treatment was given. February 8 and 15, reparative work was started. The upper left second bicuspid was the only tooth extracted; and since then the patient has been in once a month for observation. The teeth are firm and gums normal. This, however, was not all to our credit; a great part was due to his own perseverance. He followed instructions and did not miss a treatment. One of the things that helped the most was the brushing, which is true in most cases.

We teach the Ohio method:

Brush the upper teeth downward and lower teeth upward. Brush the inside of the teeth as well as the outside.

Use ten strokes of the brush for each location, beginning with the last upper teeth on the right side, on the buccal or cheek side of the teeth, with the bristles of the brush placed against the gum so that the bristles sweep downward from the gums into the space between the teeth to the occlusal or grinding surfaces.

Carry the handle of the brush against the cheek so as to allow room to return the brush without its coming in contact with the teeth. Repeat this procedure ten times.

The same procedure should now be applied to the side and front teeth on the right side; then to the front and side teeth on the left; and then to the molars on the left.

Next, clean the inside surfaces or tongue surfaces of all the upper teeth in the same manner.

Carry out the same technic with the lower teeth.

The molars and bicuspids should now be scrubbed on their occlusal (chewing) surfaces, ten strokes on the upper right side, ten on the upper left side, ten on the lower left and ten on the lower right side.

In cleaning the anterior or front teeth, both upper and lower, it is necessary to change the grip on the brush, using it more as a hook to carry the bristles in between the teeth.

Follow this by a thorough rinsing with water, or with water containing some mouth wash as a flavor, if convenient.

After the teeth have been brushed in this way with a recommended dentifrice, a rotary motion is used with clear, cold water on the gums for massage. We recommend a small hard brush, usually with bristles shorter at the tip. With this type, all surfaces in the mouth can be easily reached.

It is unbelievable that many supposedly well educated people do not know the name of the dentifrice they are using. The wife or mother buys it, more often at a sale, and does not look at the name. Nine times in ten it is a gritty or acid paste. We try to recommend a paste or powder best suited to each case. Children should be given a very mild but pleasant flavored paste. This also holds good with many adults. In cases showing the slightest irritation, we advise using a paste more saponified. Too much acid, grit or soap is to be avoided. A definite statement as to iodin in the dentifrice cannot be made,

but from cases under observation we find it tends to precipitate near the gingivae rather than to eliminate the stain.

When giving advice in diet, which is frequently expected of the hygienist, especially by the women patients, who feel freer when talking to her, we try to follow Dr. Wallace Seccombe's suggestions as nearly as possible. We are looking forward to the publication of his new charts.

One point that is particularly noticeable is that those patients who are extremely nervous, or are in poor general health, omit breakfast. We believe that health authorities will bear us out in the statement that no one of the three meals should be omitted.

There is a great field for the dental hygienist in the office of the general practitioner as well as in the schools and health centers. She can render a great service in care and instruction, and in forming habits of regular care, both at home and in the office of the dentist, on the part of many patients, if she will keep in constant touch with the clientele of the dentist in whose office she may be placed.

Discussion

Thomas B. McCrum, Kansas City, Mo.: I think that if one goes into the schools where dental hygienists work and sees them teaching children, he will go back and help convince the people and the profession as well of the value of this work.

W. O. Talbot, Fort Worth, Texas: I should like to say a word in reference to the dental hygienist doing prophylactic work in the schools along the line suggested in my paper. I note that about twenty states have laws legalizing the practice of the dental hygienist, and in some of the states in which there is no law providing for such practice it seems to be regarded as a violation of the dental law because it comes under the work of the dentist. For instance, in this state, we would not be able to employ the dental hygienist as a prophylactician in the schools without amending our law. For that reason, I investigated this subject pretty carefully before making recommendations to our state society at our business meeting in September that the next administration of the state association take up the subject of dental legislation along that line and make some provision so that these hygienists may be able to do the prophylactic work in the schools in case it may be desired to employ them for that purpose.

E. L. Pettibone, Cleveland, Ohio: For Dr. Talbot's benefit, I should like to say that Dr. C. W. Hall and two members of the Council on Mouth Hygiene made a survey of the laws of the United States relative to the dental hygienist, and after making this survey we devised an ideal law that covers most of the phases that should be covered, and that you will find in The Journal.[1] A dental hygienist is an adjunct to dental practice, dental school teaching and the dental industrial plant that is of far greater benefit than you can realize until you have observed them for two years, and in all these different divisions of their work, I want to commend them to you very highly.

Dr. McCrum: The reason a good many dentists do not favor dental hygienists is because they don't know what the hygienists do. Many dentists do not know how the dental hygienists can help in the public schools, and they do not recognize them as teachers of hygiene as they are looked upon in the Bridgeport schools. If we can get the dentists to recognize the fact that they are not only prophylacticians, but are teachers of hygiene, it will be an important step. One of the big factors in the work of the hygienists is the fact that they instil the ideas of personal cleanliness in the minds of the child.

LIFE OF A TOOTHBRUSH

According to the Manchester Guardian Commercial, the president of the American Brush Manufacturers' Association complains that the population of the United States, numbering 110 millions, only buys 40,000 toothbrushes in a year. They should buy 330 million brushes, for he openly admits that the average life of a toothbrush is only three to four months. "In my opinion," adds the writer, "a conscientious British toothbrusher will find himself swallowing bristles long before three months have elapsed, and the making of brushes with loose bristles is an easy method increasing turn-over."—*Dent. Surgeon*, April 18, 1925.

1. Codification of Dental Hygienists' Laws, J.A.D.A., 9:901 (Oct.) 1922.

PREVENTIVE DENTISTRY FOR CHILDREN

By FLOYDE EDDY HOGEBOOM,* D.D.S., Los Angeles, California

(Read before the American Dental Association, Dallas, Texas, November 10-14, 1924)

IT IS always easy to see results after they have been obtained in any line of endeavor or research. But to read the symptoms, to feel the pulse of humanity and to act accordingly is the essence of a learned profession. The age old tendency for state control of the individual is growing stronger in our social service activities. I assume that all present believe that the state exists for the welfare of the individual and not the individual necessarily for the state. Therefore, in conformance with this idea, the community, by its will, grants a franchise to corporations, which, in return, must give some valuable service to humanity. For instance, the community or state grants a franchise to run a street railway or railway system. In return, the public expects to have the use of the transportation system. Or, again, it grants a charter to a bank, which, in return, renders service to the public by conserving its financial resources. Our several states, realizing the value of dental service, created, first of all, institutions of learning for training dentists. Soon the community felt that some regulation and restriction must be placed on the scope of dental service, and our representatives set up laws regulating the practice of dentistry. Later, each state created boards of examiners to regulate the migration of practitioners from one state to another, with the central idea of protecting the public.

As time went on, the local communities appointed special officers and boards to regulate health conditions, so that now we have some local dental supervision, which usually results in the formation of a health center. In other words, dentistry is developing a great branch of social service, which necessarily is under state operation. Along with that development has come a change in the point of view of the dentist himself. The dental profession has brought forward the idea of prevention, and, as a profession, we are groping around trying to find a method of expressing prevention by results. The original franchise is now broadening into a new field and the public is beginning to ask for results.

A close study of economics will prove that any change in the financial condition affects the application of preventive dentistry as we now understand it. For instance, we have two great valleys in California divided by a range of mountains. The lives of the people in one valley depend to a large degree on the sale of raisins. A failure of crops in the valley so affects bank deposits that it is next to impossible to introduce systematic preventive dentistry from the private standpoint. In the other valley, a great municipality has so tied up the water rights that portions of the valley

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are becoming deserts. What future is there for a dentist to practice under these conditions? This is a sample of what may occur in all parts of the country. Therefore, it is absolutely necessary, in seeking to bring about better dental health conditions, to introduce some form of state help in these rural localities. We must either have a great many dentists on the state pay roll to care for these scattered units of society or else start at the other end of the scheme and educate against ignorant living.

From daily contact with all classes of people, we feel almost pessimistic enough to think that they do not want to exert an effort to be healthy. They want to live and eat without regard to the laws of health. We live to eat instead of eating to live. And when the body gives one last protest and breaks down, figuratively speaking, or many times literally, the afflicted want the elders of some religious organization to heal them by the laying on of hands. In the same spirit, people come to a dentist's office and want us to lay on gold and silver and porcelain to heal the tissues.

The idea of prevention must be sold to the public. To a large degree, the abstract idea of prevention is sold to the public, but the concrete evidence of healthy mouth conditions is being weighed in the balance. Looking at it from a coldly financial attitude of mind, we might easily say that the practice of children's dentistry is not sold to the public. Orthodontia is sold to the public and they expect to pay big fees before they go to the dentist's office. But not so the general practice of prevention and operative dentistry for children. There are many idealistic reasons why this service should be sold to the public, but if for no other reasons than financial and economic saving to the patient, why isn't it? Because it isn't as spectacular as orthodontia. Therefore let us make it spectacular if it can't be handled in any other way. In this case, I believe the end justifies the means.

Prevention as applied to dentistry means a minimizing of those adverse conditions of life that tend to shorten the period of dental efficiency. To live up to this definition, it is necessary for the dental profession to bring about a coordination between public and private agencies. Now, in doing this, we must also become students of economy in the broad sense. We worship the god of statistics and get up imposing arrays of figures dealing with dental problems. We enlarge on the mechanics of prevention but fall down wofully on the dynamics of prevention.

There is a difference of opinion as to the scope of the preventive work. In a recent paper it was pointed out that most prevention programs might be compared to the watering of a garden with a little flower spray; that is we are trying to spread over too much territory. It has probably been your observation as it has been mine that, in a small city, it is comparatively easy to put on a health program, but in the large cities and in great rural districts, it is a difficult task. Perhaps we have tried to sell before we could deliver the results. I think this is true in many places. Would it not be better to develop the points of contact as they exist? In many large cities, there are numerous so-called dental clinics which are usually running on a hit and miss plan. I feel that, in

many cases, a vision of what might be done through education has been destroyed because the governing boards see dentistry only as a repairing profession. Another point I have noticed is lack of a broad program in a given territory. For instance, the private practitioner having about 1,000 working hours per year can handle comparatively few cases, so he looks after those patients who are better able to pay for his services. It is my firm belief that the general practitioners must take care of their quota. They give many excuses as to why they do not handle children but we all recognize that they think they cannot make so much money that way. Another problem that must be solved by the private practitioner is the ability to get the children to his office at times other than after school and on Saturdays. It is a serious problem to try and crowd into those hours the work that must be done. Then the schools and health boards must coordinate with institutions and clinics so that a definite program may be carried out. The community chest idea of cooperation could be very wisely used to bring about harmony in many cities.

The hospitals of the land are classified by the American Medical Association. Our colleges and universities are classified, too. If one falls below a certain standard, that institution makes every effort to raise its standard. Why not classify dental clinics? Would it not be perfectly in order for the American Dental Association to classify the dental clinics with the idea that better service be rendered? For your consideration and discussion the following classification of dental clinics is suggested.

Class A public dental clinic, which must meet all of the following requirements.

Class B public dental clinics, in which all the requirements listed below are met but one.

Class C public dental clinics, one which fails to meet two or more of the following requirements.

Requirements. 1. The dentist must be on a salary for the time he works, because he will render better service. Volunteer service has not been uniformly successful; hence, we do not favor it as a permanent condition.

2. Some fee or remuneration must be paid for the service, either nominal or of a sliding scale type. We feel that the patient must render service for service.

3. The equipment must be of good modern type.

4. A good system of records must be kept.

5. The dentist must be a member of the governing staff on the same basis as all other members of the staff.

I have tried to bring to your minds a few suggestions as regards dental prevention. Most of us give it some consideration, but it is only by thinking the matter through to its final end that we shall begin to have light on the subject. We must "dig in" and consolidate our present condition and not endeavor to spread our work quite so much. Let us take stock in our respective states and see whether we are worshiping statistics or are achieving results.

DISCUSSION

L. W. Helm, Waco, Texas: In the matter of clinics, we must indeed get together. In many sections of our state, we have scarcely any system. The free clinic is almost unknown; as a matter of fact, we have few people so poor as to be unable to pay some fee. However, I feel that we

have a definite need of school clinics, of the proper sort, and we especially welcome the A. D. A., that we may receive needed ideas and develop the enthusiasm needed for carrying them through. The custom of having the school physician pass on dental defects is to be discouraged. I have known instances in which this was done, the physician standing by a window and, as children passed by, grading them as to skin, eyes, teeth and tonsils, sometimes fifty to seventy-five children being examined in thirty minutes. From a dental standpoint, this is worse than useless. A few of our dentists decided to make a survey of the mouths of our school children. Cards were mailed to their mothers showing clearly the children's needs. Following the second survey, we found in one school an improvement of 56 per cent. The lowest result obtained was 16 per cent.

The suggestion that we systematize our work is excellent. In too many cases the projects of our charitable organizations overlap. Each should have its specific work to perform. I take issue with Dr. Hogeboom's statement that the idea of prevention is pretty well sold to the public. It is not only not sold to the public; but it is not even sold to the dental profession. Of all of the thousands in this building this morning, we have but a sparse handful. Our work is not spectacular enough. Few of our men in practice devote their full time to prevention. One stumbling block in the way of prevention is a lack of standardization of our dental laws. Many states do not recognize the dental hygienist, with the volume of work to be done and comparatively few dentists to do it. The need of the hygienist is almost imperative.

A suggesiton was made as to fees. Many who could not pay regular fees would gladly pay small sums and in that way preserve their self respect, at the same time aiding in their small way to carry the work on for those wholly unable to pay. Again, few appreciate, to the fullest extent, services that are absolutely free.

Modern equipment is just as necessary in clinics as in our own offices. If we value the respect of our community, let us not select odds and ends at the second hand store and furnish what we call a dental clinic. Our work is too apt to reflect our surroundings. If there is one point in the paper just read that stands above others, it is the subject of record keeping. Without complete records, much of the benefit of our clinics is lost. I have seen such records as the following: "During the month of April, twenty-seven children were served in the dental clinic; in March, we served fifty-four, and in June we had a certain other number." Such a record is worthless. We will never accomplish work of a constructive nature with such a system. Dr. Hogeboom suggests that there be a dentist on every clinic staff, accepted on a basis of equality with others making up the personnel. This is absolutely necessary if we are to accomplish in the fullest measure the aims of the clinic. Only a dentist of experience can know the needs of a dental clinic, and when all clinics have such a man in charge, we will no longer have such records as "twenty-seven people served within a week"—or month or year.

Stella Risser, Houston, Texas: In all branches of medicine, including dentistry, we are beginning to be more interested in prevention. It is a matter of education, not only of the laity but also of the dental student. Students should be required to do more work on children and should be graded on this branch just as they are graded on crown and bridge and plate work. By doing more work for children, they will come to realize the importance of preventive dentistry, and will carry that interest into their practice. Another thing mentioned was the fact that children usually come in for dental service after school hours and Saturdays. Men who are thinking of specializing on children always mention this fact. The schools have educated the people to vaccination as a means of prevention, and they must be taught preventive dentistry also. When they realize that a child's health depends on the condition of the mouths and that cavities carry all sorts of disease germs, including diphtheria and other contagious diseases, they will be more anxious to have the child's mouth kept in a healthy condition. We should go to the school board and even to the legislature, to explain to them the importance of these things and tell them what preventive dentistry has meant in cities. We must emphasize the fact that in institutions in which children's mouths have been kept in a healthy condition, contagious diseases have

been practically eliminated. When this subject is fully understood, it will be given its proper place in our schools. When the dentist can make his patients understand that children's dentistry is just as important as work for grown people, or even more so, and that he must obtain the same fee for working on children's teeth, then more men and women are going to be interested in doing children's work. The first point brought out, that all persons who work in clinics or any branch of this service should be on a salary, is a very good one. We all realize the importance of the dentist's having equal rights on the board to express his ideas, because he knows and understands what is needed better than people of other professions. I think we might add a dental nurse to the list of members of health boards.

Kenneth W. Mayo, Houston, Texas: Children's dentists are getting no help from the dental profession in general, although a very few do refer some of the more fractious children to us. We do, however, have some children referred whom some of the general practitioners have worked for and have almost made nervous wrecks of by trying to finish the work hurriedly. When these children come to us, it is all that we can do to complete the work started or begin the new work to be done. How much better if the general practitioner, instead of trying to do the work on children quickly, perhaps leaving it incomplete, would refer them to the pedodontist who is in a position to do the work thoroughly. We are trying now to have a dentist appointed on the school board of Houston and on the staffs of the various hospitals of the city. We feel that when this is done, conditions will be decidedly better for dentistry as a whole, and dental health and oral hygiene in particular.

Minnie Proctor, Los Angeles, Calif.: In many clinics, the salaries are often sufficient inducement to the dentist to take up that work. Another point that Dr. Hogeboom brought out that many do not understand who have not done public health work is that the clinics in the cities have not nearly the chance for success that clinics in the small districts have, where there are fewer children and the work is therefore less difficult to handle. Many members of the profession believe that because children live in the cities, they are well taken care of. Many children in the cities have much less chance to have dental care than have children who live in smaller cities.

M. Evangeline Jordon, Los Angeles, Calif.: There is one question that should be considered very seriously if dentists are going to take up work for children, that is, working with the legislatures to give the schools permission to allow children to go to dental offices just as they go to clinics. At the present time in Los Angeles, every children's dentist—and there are quite a number of us, more than in any one place in the world, practicing in private offices—is always confronted with the fact that the teacher says, "Go to the clinic because you can go during school hours." The teachers draw their salaries from the state on the daily attendance of the child, and they will not permit any child to be excused without calling him absent. The children's parents pay the taxes supporting the clinics, so why shouldn't they be permitted the same privileges as the clinic and be allowed to bring their children to private offices during school hours? This is a question that must be taken up by the nation and be made a federal law. We will never succeed in doing our best work until we get the child at the best hour. No child coming after school, physically at a low ebb, is in any condition to have constructive work done.

Thomas B. McCrum, Kansas City, Mo.: Working for children in a clinic is quite a different matter from working for children in private practice. In the clinic, we do the most good for the largest number. Dr. Risser brought out the fact that one difficulty in working for children lay in the fact that they are in school all day. I frequently get around that by convincing the child's mother that it is unfair to expect the child to attend school all day and then undergo dental work when he is tired out. We must convince the mother that when dental care is needed, it is a more important thing for the child at that time than his school work. In a number of schools, I have been able to get the children excused without their being counted absent. To obviate having too many apply for Saturday appointments, I increase the fee for work done on that day. The children's dentist is

in somewhat the same position as was the orthodontist twenty-five years ago as regards educating the public as to the need for his work. The more children's dentists there are in a town, the more people there will be who will be educated to the need for children's dentistry, and the more children there will be who are given dental care.

Dr. Proctor: What is the law in Kansas? In California, our teachers would be breaking a law if they excused the children.

Dr. McCrum: That seems to be a personal matter. They excuse them for various reasons, chiefly illness.

Dr. Proctor: It is against the law in California.

Dr. McCrum: As far as I know, we have no law to that effect.

Dr. Jordon: I have been told regarding that law in California.

Dr. Proctor: I have been told repeatedly.

Dr. McCrum: Dr. Jordon brought out a good point: that if laws were passed, or if you are going before the school board to emphasize the need of the better care of the teeth of children, the individual should have the same opportunity as the clinic.

Dr. Hogeboom (closing): As dentists, we think too much of the mechanical side of our profession, too much of the show side of it, too much of the figures and the nice graphs and all that, and when we get down to it, we have this attitude in a town. We clean the teeth, thinking that now we have done our duty, and the children are saved. That is only the beginning. Some one took exception to what I said of the idea of prevention being sold. I said that in the abstract it was sold. Perhaps I should have used the word safety. We have already brought this matter of dental clinics before our county board of directors, and a dentist is to be appointed on the community chest. They have started a chest here in Dallas, and wherever this is done, the dentists of the city should say, "We have dental clinics here that require financing and we ask that you appoint a dentist, because if all charitable projects are to be financed together, a dentist will be best informed as to how the dental clinics should be taken care of."

INDUSTRIAL DENTAL CLINIC

The Endicott Johnson Company, shoe manufacturers, of Endicott, N. Y., have maintained a dental department for five years as part of their medical and relief work for employes and their families.

The medical staff consists of approximately thirty physicians in three hospital units, located in Binghamton, Johnson City and Endicott. Maternity cases are hospitalized at these places, while minor injuries, general medical office work and home calls are also taken care of in Binghamton.

Each hospital has a well equipped dental office with a full time dentist and assistant in attendance. The dental staff consists of Dr. W. L. Rhodes in Endicott, Dr. H. A. Niles in Johnson City, and Dr. T. H. Ivory in Binghamton.

That these clinics are well patronized may be gathered from the report of the various offices for May, 1925:

Dental fillings	790
Dental extractions	1003
Prophylactic treatments	552
Other treatments	769

Amalgam, silicate and cement are used as filling materials.

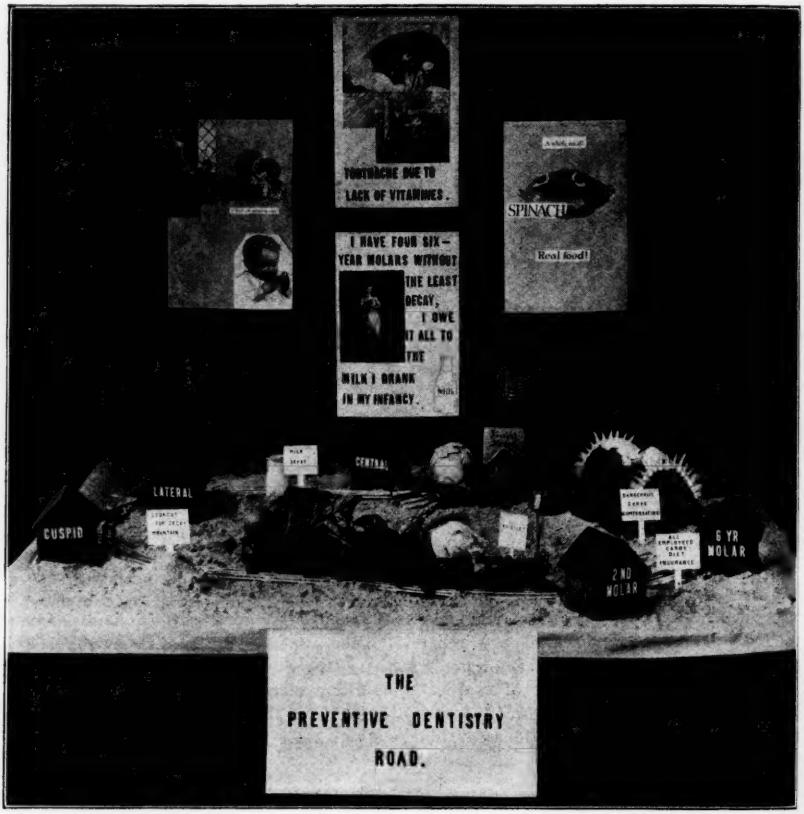
ADDITIONS TO THE BOOKSHELF

Everyday Mouth Hygiene. Ed. 2. By Joseph Head, M.D., D.D.S., Dentist to the Jefferson Hospital, Philadelphia. Published by W. B. Saunders Company, Philadelphia, 1925. 67 pages, with 39 illustrations. Price, $1.00.

Dramatizing Child Health. A New Book of Health Plays, with Chapters on the Writing, the Producing and the Educational Value of Dramatics. By Grace T. Hallock; decorations by Harrie Wood. Published by the American Child Health Association, New York, 1925. Illustrated; 306 pages.

"THE PREVENTIVE DENTISTRY ROAD"*

"The Preventive Dentistry Road" visualizes the thought that health-building foods—milks, fruits and vegetables—are an important factor in the development of a sound set of teeth in well developed jaws. To have the proper structure, we must have the right materials, and these are supplied through food.


TOOTHACHE DUE TO LACK OF VITAMINES.
SPINACH
Real food!
I HAVE FOUR SIX-YEAR MOLARS WITHOUT THE LEAST DECAY, I OWE IT ALL TO THE MILK I DRANK IN MY INFANCY.
CENTRAL
LATERAL
CUSPID
2ND MOLAR
6 YR MOLAR
THE PREVENTIVE DENTISTRY ROAD.

This exhibit consisted of a table covered with sand on which was placed a toy train of cars on a track. The cars were loaded with calcium, phosphorus and iron containing foods such as oranges, apples, strawberries, grapefruit, celery, radishes, lettuce, spinach, onions, carrots, turnips, beets, asparagus and cabbage, which were being delivered to the various stations, located at intervals along the track, and called Central Station, Lateral Station, Cuspid Station, 1st Molar Station, 2nd Molar Station and First Permanent Molar Station. A freight house in which were stored more of these essential foods was also featured.

A small toothbrush was placed in the

*An exhibit and clinic presented by Josephine E. VanderWolff, D.D.S., Chicago, Ill., and E. Ethel Taggart, D.D.S., Freeport, Ill., at the Illinois State Dental Society Meeting, Peoria, Ill., May 12-14, 1925.

smokestack of the engine, carrying with it the thought that daily brushing of the teeth is also a means of prevention.

"All Employees Carry Diet Insurance" is a sign over the road.

"Lookout (for decay) Mountain" (in the sand) is passed on the way, conveying the idea that periodic examinations are also necessary as a preventive measure.

Contact Point, Milk Depot and Dangerous Curve are all points along the road and, finally, the Dental Arch, a tunnel through which the train passes, is reached. At each end of this tunnel is pasted a complete set of teeth cut out of cardboard. This is the logical terminus of the journey, a complete and perfect dentition.

PRIZES FOR GOOD TEETH

We are not unmindful of the great amount of good done by the distribution of prizes for good teeth, nor do we fail to realize that it is but a means to an end. There is, however, another angle to the matter that deserves attention. Awards and prizes in all cases, but more especially with young people, should be made on the basis of results obtained through earnest and patient effort rather than for a natural endowment for which the individual really deserves no credit.

Thoughtful people, who have the best interests of the youth of our land at heart have for such reason decried the beauty contests so common all over the country. Some young women, little more than fine physical morons, have enjoyed a popularity and opportunity for travel, not to mention money prizes that cannot but undermine the faith of other young women of the same community who have been putting forth real effort in some special line of study, trying to acquire somethiing of real value in music, or art, or literature, or business, and finding but scant appreciation of their efforts.

In a somewhat similar way we know of a thirteen-year-old boy who suffered the first blow to his faith when after a long and patient and satisfactory orthodontic treatment he missed the dental prize by one point because the examiner said there was a stain from a band on one tooth. The stain, as a matter of fact, was the result of a flat contact on a deciduous molar. This boy with his under-developed jaws and crooked teeth could not have gotten even a favorable mention but all the efforts put forth in his case received no consideration in the contest and he missed his prize by one point. Doctor, how would you feel if you were the boy?—*Minn. Dist. Dent. J.*

THE QUESTION OF SCHOOL DISTRIBUTION OF TOOTHBRUSHES.

In the report of the first meeting of the Advisory Educational Group of the Metropolitan Life Insurance Company, the following statements were made concerning the advisability of furnishing material for school use—toothbrushes, etc.:

> "The question was raised as to whether or not it was considered advisable for an outside organization such as the Metropolitan Life Insurance Company to furnish toothbrushes, towels, and other similar materials for school use. Members of the conference very strongly disapproved such a procedure as one that in effect offered charity to the school children. It was pointed out that the more children are compelled to provide material of this kind themselves, the more permanent is the influence of the instruction given."
>
> It was the sense of the conference that although it is highly desirable to furnish reliable information and literature to pupils in our schools, it is exceedingly undesirable to provide or offer material other than that which may be regarded as information.

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Editorial

CONFUSION IN DENTAL EDUCATION

If any man can predict with reference to dental education in this country what the outcome is to be in the next few years, he is a prophet of no mean order. The original commercial "57 varieties" are threatened with eclipse as compared with the present professional varieties. Nearly every leading man who is in any way connected with dental education, as well as some who are not connected with it, seems imbued with his own particular plan, which, by the way, is in the main different from the plans of others. This is leading to much confusion, and the rank and file of the profession are at sea: they do not know what to expect.

There is the plan suggested by some of having one year of predental work and four years of dental training—all five years being spent in a dental school; there is another plan of having one year of college work, spent in a university, and four years of training in a dental school; another plan of having two years in a university and three years in a dental school; another of two years in college and four years of dental training; and still another adhering to the present requirement of graduation from an accredited high school and a four-year course in a dental college. These plans cannot all be the best, and yet each one has its advantage—at least, each has favorable features for argument. And there is plenty of argument.

It is not our function here to advocate any plan, but it may be well for the powers that be—if, perchance, there are any recognized powers—to pause and consider some of the factors that enter into the situation.

It is a very easy matter for men—highminded, conscientious and altruistic men—to sit around a table in conference and formulate a scheme for dental education that seems to them practical, feasible and progressive. They may debate the matter pro and con till they are thoroughly convinced of its desirability and its applicability—till there is in their minds no flaw in its essential features. But at best it is only theoretical, and too frequently it fails to take account of the varying conditions in different sections of the country—too frequently it smacks of *ipse dixit* more than it does of consideration for the people, in whose interests, after all, we are supposed to legislate in these matters.

It is one thing to formulate an ideal theory in committee and another to make it work for the greatest possible benefit to the people at large. Men who are given to theorizing constantly, and who are not called on to put their theories in practical operation by actual experience in college teaching are not in the most favorable position to suggest the best plan for carrying on this work. There should be in all these deliberative bodies a goodly number of college men who have gone through the acid test of teaching students, and who therefore have been face to face with the real problems as they exist in our colleges.

Then there is another aspect that must be reckoned with: We must not go faster in our educational evolution than conditions in our commonwealth will justify. Everyone, of course, should be in favor of constantly advancing standards in our requirements—it is the tendency of our civilization; but we must have a care not to raise the standards too abruptly, else we shall have a backfire. If we go too fast and limit too suddenly the number of graduates coming into the profession, we are in danger of drawing the fire of our state legislatures, who the moment they think we are building too high a wall around dentistry will proceed to put holes through that wall by legislative enactment, as was recently done in the state of Tennessee.

The whole trend of our thought along educational lines should relate solely to the problem of preparing young men and

women for a better and wider service of the people of this country; in other words, the interests of the people should be made paramount to every other interest. All of our deliberations are vainglorious and unworthy unless they tend in this direction, and there is no blinking the fact that some of our recently proposed plans in dental education have seemed to ignore the people; at least, that portion usually known as the common people.

In the ultimate, we have unbounded faith that out of the present chaos the best system of education will be evolved; but much chaos must be eliminated before this can be brought about, and, in the process of elimination, there must be a generous yielding on the part of existing factions, which will lead to a broad-minded recognition of the inherent rights of the people at large.

C. N. JOHNSON.

DENTAL EDUCATION

Considered as a whole the practice of dentistry is, in effect, a combination of the arts of medicine and mechanics, largely on the basis of fine art, applied to the teeth and mouth directly. Oral (with correlative systemic) health service is the fundamental purpose of the practice of dentistry. Mechanical procedures are its chief ways and means. Artistic oral restorations and reconstructions are its esthetic achievements. Medicine, mechanics and art constitute the tripod on which the whole of modern dentistry rests. Pull away one of the three legs of the tripod, and dentistry ceases to be itself. Antagonism between medicine and dentistry cannot be explained on any basis of public interest or advantage, and has no jurisdiction whatever in any sentiments that are worthy of respect. Dentistry is neither a political party nor a secret society. It is not an organization of dentists, conducted by dentists, for dentists. Dentistry is an accredited agency for public service, open to public inspection, subject to public regulation, and subservient to enlightened public opinion. Dental education is a function of universities. The most favorable conditions for instruction in dentistry are plainly those provided in the universities by cordial cooperation between teachers of dentistry, and those of the schools of medicine and engineering. Such cooperation insures most effective teaching under the most advantageous circumstances for all concerned.—*Nation's Health.*

Medical and Dental News

Arkansas

Advisory Executives of 7th International Congress: The following have been chosen as officers of the Arkansas State Advisory Committee of the Seventh International Dental Congress: president, G. C. Jernigan, Rector; first vice president, Elbert Stewart, Little Rock; second vice president, J. J. Newman, Little Rock; secretary-treasurer, H. J. Crume, El Dorado.

California

Advisory Executives of 7th International Congress: The following have been chosen as officers of the California State Advisory Committee of the Seventh International Dental Congress: president, John D. Millikin, San Francisco; first vice president, O. E. Jackson, Petaluma; second vice president, Edward J. Howard, San Francisco; secretary-treasurer, B. Frank Gray, San Francisco.

Colorado

Newly Elected Officers of State Society: The newly elected officers of the Colorado State Dental Association are as follows: president, Harry W. Wilson, Denver; president elect, C. S. Kramer, Woodmen; vice president, W. O. Brubaker, Denver; secretary, Harry B. Talhelm, Denver; treasurer, William Smedley, Denver.

Advisory Executives of 7th International Congress: The following have been chosen officers of the Colorado State Advisory Committee of the Seventh International Dental Congress: president, Max Giesecke, Denver; first vice president, Mallory Catlett, Denver; second vice president, C. S. Kramer, Woodmen; secretary-treasurer, William H. Flint, Littleton.

Connecticut

Health Law for Teachers: All applicants for admission to the state normal schools of Connecticut are required to undergo a physical examination, and those found to be suffering from defects and diseases that would be expected to interfere seriously with teaching or endanger the health of pupils are excluded from the normal colleges.

Illinois

Kankakee Dental Clinic: At the dental clinic held before the close of school at the Jefferson School, 95 per cent of the children examined were found to have defective teeth. The same percentage of dental defects were found at the Whittier School.

Advisory Executives of 7th International Congress: The following have been chosen as officers of the Illinois State Advisory Committee of the Seventh International Dental Congress: president, P. G. Puterbaugh, Chicago; first vice president, F. B. Moorehead, Chicago; second vice president, J. P. Luthringer, Peoria; secretary, Albert E. Converse, Springfield; treasurer, T. A. Broadbent, Chicago.

Indiana

Advisory Executives of 7th International Congress: The following have been chosen as officers of the Indiana State Advisory Committee of the Seventh International Dental Congress: president, Frank A. Hamilton, Indianapolis; first vice president, C. R. Jackson, Indianapolis; second vice president, A. R. Ross, Lafayette; secretary-treasurer, C. L. Byers, Indianapolis.

Dental College Sold: The dental college at Pennsylvania and Walnut streets, Indianapolis, was sold, June 2, for $35,000 to Indiana University. The state will occupy the building for a year. It is the plan to transfer the college eventually to the medical college community on West Michigan, now the site of the Riley and Long hos-

pitals and the medical schools.—Indianapolis M. J., June, 1925.

Iowa

Burlington Plans Medical Arts Building: The Physicians and Dentists Building Company has completed arrangements for an office building to be occupied by the physicians and dentists of Burlington. The plans call for a seven story brick building of steel construction, to cost $245,000. It is expected that the building will be completed in seven months.

Advisory Executives of 7th International Congress: The following have been chosen as officers of the Iowa State Advisory Committee of the Seventh International Dental Congress: president, R. H. Volland, Iowa City; first vice president, James Hallett, Des Moines; second vice president, John G. Hildebrand, Waterloo; secretary, Earle S. Smith, Iowa City; treasurer, F. H. Waters, Ames.

Massachusetts

Dr. Taft Retires: After more than fifty years in the practice of dentistry, Dr. Ezra F. Taft of Cambridge retired, July 1. For thirty-three years he has had an office in Harvard Square. Dr. Taft, who reached the age of 79 years last March, graduated from Amherst College in 1867. He began the study of dentistry with Dr. E. G. Leach, and on September 23, 1868, the day on which a charter was granted to Harvard Dental School, he registered as the first matriculant. He held the position of instructor for the advanced class in the Harvard Dental School for twelve years, beginning in 1892. He was for many years a member of the Harvard Odontological Society and still retains his membership in the Harvard Dental Alumni Association and the Massachusetts Dental Society.

Michigan

Intercity Dental Association Elects Officers: At a meeting of the Intercity Dental Association in Cassopolis, June 22, the following officers were elected: president, Ernest A. Reid, Benton Harbor; vice president, W. E. Sargent, Buchanan; secretary-treasurer, F. A. Van Riper, Hartford. Preceding the election of officers, the society enjoyed a golf tournament and banquet. The next meeting will be held in Benton Harbor, the first Monday in August.

Nebraska

Advisory Executives of 7th International Congress: The following have been chosen officers of the Nebraska State Advisory Committee of the Seventh International Dental Congress: president, M. E. Vance; first vice president, E. H. Bruening, Omaha; second vice president, W. L. Shearer, Omaha; secretary-treasurer, H. E. King, Omaha.

New Jersey

Physicians Not Liable for Cures: Unless actual negligence is shown, physicians are not liable for cures, except when specifically promised, is the ruling of the Supreme Court. In upholding the action of the Hudson Circuit Court, the higher court dismissed a complaint brought by Albert Gramaldi, of Jersey City, against Dr. Peter J. Zeglio, visiting physician at the Muhlenberg Hospital, Jersey City. Gramaldi was treated as a patient at the Plainfield Hospital for a broken wrist. The wound became infected, and he lost the use of the member. Suit for damages was then instituted. The court held in that should Gramaldi be allowed to press his suit every physician would be subject to lawsuits if the cures were not effective. The court said that infection could come from a variety of causes, and that all the physicians can do is to aid Nature in disposing of poisons.

New York

Dental Service: At the suggestion of the Dispensary Development Committee of the New York Academy of Medicine, and with the approval of the New York Oral Hygiene Committee, a committee on community dental service has been organized by the New York Tuberculosis and Health Association. The Dental Community Service of this Association will have as objectives in this particular work to acquaint the public through popular health education with the importance of proper care of the teeth; to further the maintenance of proper standards of dental service in clinics and hospitals; to promote an educated public opinion that will advance dental prophylaxis among children, particularly in the schools. The program of work for health education in the care of the teeth will be spread through speakers in schools, clubs, factories, labor unions, through exhibits and the distribution of literature and posters, by mov-

ing pictures, by articles in newspapers and in other organs of publicity. Dental prophylaxis among children will be promoted by reviewing the experience of school clinics and of other demonstrations for children, and by continuing the cooperative plan of the New York Tuberculosis Association with the Columbia School of Oral Hygiene, whose students work in public and parochial schools.—Bull. N. Y. Tuberculosis and Health Association.

North Carolina

Advisory Executives of 7th International Congress: The following have been chosen as officers of the North Carolina State Advisory Committee of the Seventh International Dental Congress: president, J. Martin Fleming, Raleigh; first vice president; F. L. Hunt, Asheville; second vice president, C. L. Alexander, Charlotte; secretary-treasurer, E. B. Howle, Raleigh.

Porto Rico

Work of Carolina Dental School Clinic: With the close of the school year, the dental clinic conducted in the Carolina rural schools, numbering thirty-one, and the graded schools, numbering eighteen, completed its first year's work. Carolina has a population of 15,560 and 2,500 pupils are enrolled in the schools. The work was done in connection with the Junior Red Cross. Dr. L. Ruiz-Soler of San Juan came to Carolina three times weekly to hold the clinic, there being no dentist located in the town. The work completed during the year is as follows: pupils examined, 930; pupils treated, 544; extractions, 1,078; amalgam fillings, 335; cement fillings, 6; synthetic fillings, 52; cement bases, 60; prophylactic treatments, 182; pulps extracted, 37; canals filled, 36; other treatments, 199. Twenty-two class talks on the care of the teeth and toothbrush drills were given, and five conferences were held in the assembly hall. The clinic will open again, September 1.

South Carolina

Advisory Executives of 7th International Congress: The following have been chosen as officers of the South Carolina State Advisory Committee of the Seventh International Dental Congress: president, George W. Dick, Sumter; first vice president, H. M. Hucks, Georgetown; second vice president, E. C. Dye, Greenville; secretary, H. J. Ray, Aiken; treasurer, David Aiken, Winnsboro.

South Carolina

Lyman Dental Clinic: Through the efforts of the parent-teacher association of Lyman, whose members made a house to house canvass in order to reach all school children, a dental clinic was held in the rest room of the school building recently. Drs. Folger and McCullough of the state health department had charge of the clinic.

Counties Employing School Dentists: The following counties of South Carolina employ dentists to do work in the public schools: Aiken, Colleton, Laurens, Charleston, Darlington, Florence, Union, Lee, Orangeburg, Spartansburg, and Sumter. —Southern Med. J., June, 1925.

South Dakota

Newly Elected Officers of State Society: The newly elected officers of the South Dakota Dental Society are as follows: president, W. W. Price, Centerville; vice president, L. S. Spencer, Watertown; secretary, E. W. Elmen, Sioux Falls; treasurer, E. O. Dietrich, Sioux Falls. The next meeting of the society will be held in Sioux Falls.

Tennessee

Advisory Executives of 7th International Congress: The following have been chosen as officers of the Tennessee State Advisory Committee of the Seventh International Dental Congress: president, L. G. Noel, Nashville; first vice president, R. Boyd Bogle, Nashville; second vice president, David P. Houston, Chattanooga; secretary, O. A. Oliver, Nashville; treasurer, George L. Powers, Memphis.

Virginia

Dental Clinics Held: Three hundred and ninety-seven school children had work done on their teeth at the dental clinics held at Pleasant View and Amherst recently. When the schools reopen in the fall, the clinics will be resumed. The clinic is conducted by the state department of health.

Dr. Thornton Dean of Dental School: At a meeting of the dental faculty of the Medical College of Virginia, in May, Dr. R. D. Thornton was chosen to succeed Dr. J. A. C. Hoggan, resigned, as dean of the school of dentistry. The appointment became effective, July 1.

West Virginia

Advisory Executives of 7th International Congress: The following have been chosen

as officers of the West Virginia State Advisory Committee of the Seventh International Dental Congress: president, C. H. Neill, Fairmont; first vice president, Homer Mannon, Huntington; second vice president, O. W. Burdatts, Wheeling; secretary, Fred E. Hess, Fairmont; treasurer, H. L. Satterfield, Fairmont.

Wisconsin

New Dental Quarterly: With the June issue, the *Wisconsin Dental Review* makes its initial appearance. Other issues will appear in September, December and March. R. W. Huegel is the editor, and the periodical is published at Madison.

Wyoming

Joint Medical and Dental Society Meeting: The Wyoming state medical and dental societies met in joint session, June 22, at Buffalo. An address on "Secret Fear" was given by C. S. Bluemel, M.D., Denver, and T. J. Drew, D.D.S. of Casper, spoke on "Cooperation of the Physician and Dentist in Regard to Focal Infection."

General

Shortage of Physicians in Army: It is reported that a serious shortage of personnel exists in the Army medical corps, owing to resignations. The shortage now numbers sixty-one. The five vacancies in the dental corps have been filled by the following appointments: 1st lieutenants: Mackey J. Real, Maurice W. Quigley, James M. Epperly and James H. Pence, of the dental reserve corps, and 2nd lieutenant, Everitte F. Arnold, infantry, regular Army.

Naval Dental Corps: Changes in stations and duties of officers of the Navy dental corps will be made as follows: Lieutenant Commander Ernest W. Lacy from naval medical supply depot, Brooklyn, N. Y., to Asiatic station; Lieutenant Commander Harry E. Harvey from naval hospital to Naval Medical School, Washington; Lieutenant Commander George H. Reed, from naval hospital, Canacao, P. I., to receiving ship, San Francisco; Lieutenant Harold A. Daniels from naval training station, Hampton Roads, Va., to naval medical supply depot, Brooklyn, N. Y.; Lieutenant William R. Taylor from receiving ship, San Francisco, to naval training station, Hampton Roads; and Lieutenant Alfred R. Harris from temporary duty under instruction at Naval Medical School, Washington, to temporary duty at naval hospital, Mare Island, Calif.

Lieutenant Commander Paul G. White, attached to naval hospital, Norfolk, Va., and Lieutenant Hubert J. Lehman, attached to naval hospital, Mare Island, have been assigned to additional duty as instructors at the pharmacists' mates' school at Portsmouth, Va., and hospital corps training school at Mare Island, respectively.

Lieutenant Commander Marion E. Harrison, who recently reported for duty in the bureau of medicine and surgery, has been assigned to additional duty as a member of the naval examining board for examination of dental officers for promotion, vice Lieutenant Commander Lucian C. Williams.

Drs. Morris H. Furman, of New York City, and William H. Griffin, of South Boston, Mass., have been enrolled in the confirmed grade of passed assistant dental surgeon, U. S. N. R. F., 6. —Army and Navy Register, June 20, 1925.

Army Dental Corps: Col. Seibert D. Boak to duty at Presidio of San Francisco upon completion of service in Philippines.

Col. William H. Chambers to duty at Military Academy, West Point, N. Y., upon completion of service in Hawaii.

Lieut. Col. Frank L. K. LaFlamme from duty at Military Academy, West Point, N. Y., Oct. 15 to New York City and about Dec. 4 via government transportation to Hawaii for duty.—Army and Navy Register, June 20, 1925.

Health Education Conference: A health education conference was held at the University of Chicago, June 23-26. Dr. Thomas D. Wood, of Columbia University, was general chairman. The conference was divided into three sections: 1. Secondary Schools. 2. Training Teachers for Health Education. 3. Materials. A "Demonstration of Vitamin Deficiency and the Physiology of Digestion" was given on Friday by Dr. Andrew Conway Ivy.

Dentists and the Gorgas Memorial: Thirty-five thousand dentists who are members of the American Dental Association have joined hands with the Gorgas Memorial Institute in its work of decreasing preventable illness and the consequent premature deaths which result from ignorance, carelessness and lack of hygiene. The cooperation of dentists will mean a triple al-

liance of physician, dentist and individual to back the fight to conquer disease.—J. Indiana M.A., May, 1925.

Proposed Dental Bill: In a resolution adopted by the Pennsylvania Dental Society, at the opening of its fifty-seventh annual convention, May 5, in Reading, Governor Pinchot was asked to veto a bill relating to dental standards. This bill, which is before the Governor, attempts to lower the standards for admission to the profession by permitting licenses to persons "who call themselves dentists," but who "cannot get licenses under present laws."

Smallpox Spreads in Many Countries: According to the monthly epidemiologic report of the health section of the League of Nations Secretariat, smallpox is not alone prevalent in the United States, but is general throughout the world at the present time, England, Spain, Switzerland, Algeria and Tunis showing an increase in the disease. The type of the disease is different from that of previous years in the United States, with a higher death rate.

Deaner Institute Given to Public: In turning over Deaner Institute to the public, Drs. Deaner and Jordan give over all control to a board of trustees, who will administer the affairs of the institute until some future time when it shall be incorporated into a Kansas City university. The clinic will be conducted as a dental research hospital. Under its charter, the institute can never be run for profit, every cent taken in being used for salaries of specialists and nurses, running expenses, expansion and improvement of the institute and research work.

Naval Dental Corps: Changes of station and duties of officers of the Navy dental corps will be effected as follows: Lieutenant Commander John V. McAlpin from first brigade of marines, Port au Prince, Haiti, to naval dispensary, Washington; Lieutenant Commander Thomas L. Sampsell from Washington Navy Yard to 15th naval district, Panama; and Lieutenant William J. Rogers from that district to naval torpedo station, Newport, R. I. * * * Lieutenant Commander James L. Brown, who recently was assigned to duty with the 4th regiment of marines at San Diego, Calif., is accompanying the marine expeditionary force with the fleet during the Hawaiian maneuvers. * * * Dr. Armin T. Fellow, of Philadelphia, has been enrolled in the dental corps of the naval reserves, with the provisional rank of lieutenant commander.—Army and Navy Register.

Dental Care of the School Child: In speaking of the annual report of Sir George Newman, chief medical officer of the board of education, Public Health says, as regards the dental situation: "If the dental scheme detailed could be carried out in its entirety it would mean that in a few years every school child would have its teeth examined once a year and would receive any necessary treatment. Assuming that there are 6,000,000 school children and that a full-time dentist can deal with 5,000-6,000 children yearly, about 1,000 school dentists would be required, or more than two-thirds of the number at present on the Dental Register."

Mortality Statistics: According to the statistics of the Metropolitan Life Insurance Company, 1924 was the healthiest year, every important cause of death, with the exception of automobile fatalities, having registered a decrease over the rate of the year before, including influenza, typhoid, tuberculosis, pneumonia, cancer, diabetes, maternity, alcoholism and fatal accidents.

Shortage of Rural Physicians: At a recent congress on medical education, licensure, public health and hospitals held under the auspices of the American Medical Association, Dr. William L. Bailey of the department of sociology at Northwestern University analyzed present conditions and tendencies in American rural areas. The number of persons leaving the farms for the cities has doubled since the war, he stated. This can be checked by better schools, better roads, and by better health conditions, which, Dr. Bailey said, can be obtained by sending more young doctors into rural and small town communities. He suggested that graduates of medical schools be allowed to spend the two years now taken up as internes in hospitals in rural districts in actual practice. This, he pointed out, would send more doctors to the country and would improve health conditions.

More small medical schools, dotted over all the country, were suggested by Dr. William A. Pusey, president of the American

Medical Association, who spoke on the problem of distributing physicians over the United States. The seven year courses with their rigorous requirements should be shortened, Dr. Pusey said, and more practical experience and less detailed informative courses given. His address caused a flurry of comment after the meeting had formally closed and disclosed a keen interest among the physicians on the subject of making the education for physicians an easier one to acquire.

Medical and Dental Cooperation: In the past, there was a border line between medicine and dentistry. Today, the two overlap, and interweave to the extent that cooperative diagnosis becomes the only hope of a successful coping with the problem of disease (Stephen Palmer, in Ninth District Dent. Bull.). The question of focal infection, which has opened a new field of exploration, has, since the advent of the roentgen ray been the source of many conflicts between the medical specialist and the dentist. In both medicine and dentistry, correct diagnosis and intelligent prognosis are prerequisites to effective treatment. The family physician with his case history and the dentist with his records must cooperate in order to diagnose the borderline case. A complete dental record covers: (1) prophylaxis, (2) history from patient and physician, (3) dental history, (4) clinical history, (5) instrumentation, each tooth being examined, (6) examination of soft tissues, (8) electrical testing for vitality of teeth, (9) illumination of neighboring sinuses and (10) bacteriologic examination. Too many physicians, dentists and patients place the whole burden of diagnosis on one or two roentgenograms; whereas, roentgenography is merely one factor in diagnosis. When the whole mouth is in bad condition, with tissues inflamed and teeth plainly carious, the diagnosis can be made without the roentgen ray; but the latter becomes necessary when the state of any tooth is uncertain, though it is of little value without the clinical history and examination. Physicians are too prone to condemn the suspicious tooth to extraction. It is to be hoped that in time to come the physician will be taught more dentistry, the dentist more medicine. "The secret of good health, of good teeth, is prophylaxis. The secret of reducing the source of infection is prophylaxis. The secret of prophylaxis is education. The secret of education is cooperation. The secret of cooperation is understanding. Finally, the secret of health and happiness is the cooperation of all specialists of medicine."

Deaths

Angle, James C., Santa Barbara, Calif.; University of Pennsylvania School of Dentistry, 1916; killed in the Santa Barbara earthquake, June 28, 1925.

Barker, Andrew J., New Britain, Conn.; died, May 15, of pneumonia; aged 52. Dr. Barker had been in practice about thirty years.

Foote, J. S., Omaha, Nebr.; scientist and author, and for thirty-one years a member of the medical faculty of Creighton College, died, June 30, from angina pectoris: aged 74. For more than twenty-five years Dr. Foote had taught physiology and pathology, and he had written much on the subject of bone structure of man and animal. Much of his recent work had been done under the auspices of the scientific foundation and research commission of the American Dental Association. Burial took place in Naugatuck, Conn.

Irving, William W., New York City; New York College of Dentistry, 1899; jumped from the window of his apartment and was killed, June 20. Dr. Irving had recently suffered a nervous breakdown, and had just returned home after spending some time in a sanitarium.

Levy, Joseph M., New York City; New York College of Dentistry, 1899; died recently, aged 46.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Use of Ultraviolet Energy: In an attempt to classify indications for the use of ultraviolet energy in medicine, Leo C. Donnelly (J. Radiol., May, 1925), after administering 20,000 treatments and reading all the literature published in English within the last five years on the subject, concludes that, intelligently used, ultraviolet energy furnishes the physician a force which is: (1) a direct germicide; (2) an indirect germicide; (3) a counter irritant; (4) a means of producing increased resistance to infection; (5) an analgesic; (6) a means to depress metabolism; (7) a means to stimulate metabolism; (8) a means to stimulate the sympathetic nervous system; (9) a means to regulate mineral metabolism; (10) a means to balance endocrine secretions; (11) a means to overcome disturbances caused by vitamin deficiencies.

Dentin and Enamel: Retterer's study has confirmed that dentin and enamel have a common protoplasmic origin. Transformation of the dentin into enamel occurs before eruption, under the influence of compression exerted by the sac and by the gum.—*Comp. Rend. Soc. Biol.*, abstr. *J.A.M.A.*, May 30, 1925.

Twins in Health and Disease: The evidence presented by Murray is said to show that similar twins not only closely resemble each other in appearance and character but also in the finer details of structure and metabolism. This similarity renders them liable to suffer from those diseases which are due to some inborn error, which sooner or later indicates its presence by definite symptoms of disease. Conversely, those diseases which are found to occur in both twins are most probably due to an inborn error, rather than to external circumstances. It is therefore important to remember that when such a malady develops in one of similar twins, it is not unlikely to develop in the other. The healthy twin under these circumstances should be watched and any possible steps taken to prevent the onset of the same malady, or, at any rate, to treat it in its earliest stage.—Lancet, abstr. J.A.M.A., May 2, 1925.

Pulse as Guide to Anesthesia: After gaining the confidence and cooperation of the patient, and beginning anesthetization very deliberately, Garrett Hogg (Am. J. Surg., April, 1925) counts the pulse continuously in an effort to keep the patient just far enough under the effects of the anesthetic to assure relaxation and not far enough under to invite shock and other objectionable symptoms. For women, the usual pulse rate under ether is 18 beats to 10 seconds; for men, 14 or 15. Should the pulse slow down, administration is stopped until the normal rate is resumed. With too little ether, the rate will increase, but this occurs long enough before the muscles begin to tighten to give the anesthetist plenty of time to increase the dose. In order to maintain such a shallow anesthesia, the anesthetist must give all of his attention to the patient.

Oral Effects of Tuberculosis: In observations on the effect of tuberculosis on the teeth, gums and jaws, Lester R. Cahn (*Dent. Cosmos*, May, 1925) draws the following conclusions: Tuberculous disease can make itself manifest in the oral cavity, aside from tuberculosis ulcerations and osteitis. These other lesions are: (1) Cervical cavities. (2) Gingivitis with loss of interdental papillae, the space occupied by these papillas being filled with a peculiar brownish sordes. (3) Large intertrabecular spaces revealed by the roentgenogram. This latter symptom is not always constant but occurs sufficiently often to be characteristic. Three illustrative cases are reported.

The Well Built Body: A well built body shows the following points: strong even teeth, closing well, no cavities; eyes clear and bright, no puffiness under eyes; clear skin; good color in cheeks, lips, eyelids and ear lobes; even shoulders and flat shoulder blades; deep, broad chest; straight back; flat abdomen; firm muscles and sufficient, firm subcutaneous tissue; straight legs; normal size of knees and ankles; strong foot arches; antero-posterior foot position; good posture. A body in good running order is indicated by: alert expression; unobstructed breathing; clear, red tongue; steady nerves, no restlessness, i.e., repose; cheerful disposition; good muscular coordination; no distress on ordinary exertion; proper weight for height, age, and type.—Hugh Chaplin, in *J. Home Economics*, June, 1925.

Sarcoma of Tonsil: A case of primary sarcoma of the tonsil, with successful operation, is reported by Edwin McGinnis (Illinois M. J., April, 1925). The patient, a woman aged 63, was in excellent health, and there was no history of malignancy in the family. There was no external swelling. Three postoperative roentgen-ray treatments were given externally. A study of sixty-one case reports revealed fifty-five involving one tonsil, and six in which both tonsils were involved.

Diagnosis in Orthodontia: What then is diagnosis? It is a reasonable application of all that is known etiologically and developmentally to the condition of the patient at hand. It should encompass all the known predisposing causes as well as the supposed determining causes. Now then, who can make this sort of diagnosis? It may be said that the dentist is unprepared to make such a diagnosis, but I believe that the majority of men practicing orthodontia can soon learn to improve their ability to study their patients in their environment. We need primarily to change our attitude and view the patient as an organism corresponding to an environment. How accurate can we make our diagnosis? Just as accurate as our knowledge of environment and the individual reaction of the patient to the environment. After all has been said, at best a diagnosis in the present status of our knowledge is a reasonable explanation, a verdict based upon three sources of evidences: (1) Data from a physical examination of the patient's body and past environment. (2) History of the patient's affliction, as revealed by the parent, nurse, teacher and physician. (3) General knowledge of the normal mouth and malocclusion and the factors producing each.—Harvey Stallard, in Pac. Dent. Gaz., April, 1925.

Treatment of Black Tongue: When a patient with a black stain upon the tongue appeals for treatment, which is not often the case, as the genuine black tongue causes no discomfort and is usually discovered by chance, an effort should be made to ascertain, if possible, whether the discoloration is an authentic case or merely an accidental pigmentation. In mild cases of the genuine type, the thorough swabbing of the discolored patch with pure hydrogen peroxide (3 per cent), followed by a warm physiological saline solution, will promptly relieve the condition after several treatments. In the more severe cases, a 10 per cent solution of salicylic acid in a mixture of equal parts of alcohol and glycerin and applied on a swab once or twice a day acts as an effective keratolytic agent which will dissolve the corneous papillae. It should be followed by the H_2O_2 application and salt water, as stated above. An effort should be made to relieve existing inflammations of the gums and the tongue and oxidizing mouth washes, unless followed by warm water, and those containing tannic acid should be avoided. The removal of the fur by scraping or shaving has occasionally been employed; however, the patch will, as stated, return shortly. In general, the use of caustics for this purpose should be emphatically discouraged. — Hermann Prinz, in Pac. Dent. Gaz., March, 1925.

Rheumatism: W. G. MacCallum, Baltimore (J.A.M.A., May 23, 1925), says that great confusion has prevailed in the use of the term rheumatism, since it has been applied to all sorts of painful affections of the joints and even to more indefinite muscular pains. Rheumatism is an infectious disease that occurs in children or in young adults, sometimes with a very acute course, more often progressing slowly with several explosions of acute illness in which different symptoms may become especially prominent. It may subside and leave the patient in a state of apparent well being, but it

usually produces permanent changes in the heart, which disable it to some extent and predispose it to secondary infections, which distort it still further and may lead to death. Other affections that might possibly be confused with rheumatism are numerous. From all these diseases, rheumatism stands out sharply distinct. If attention is centered on the joint affection, it is soon realized that, although excessively painful, the changes in the joints in rheumatism differ from all the others in affecting especially the periarticular tissues and not being destructive. No bacteria have been found constantly present in the joint fluid, and the pain disappears after a time, leaving the joint almost unchanged from normal. In reality, the joint affections in rheumatism are only an incident in a serious disease and are temporary, producing no such grave anatomic changes as are found in other similar diseases. Rheumatism as a disease of childhood runs a somewhat different course from that seen in adult life, in that some of the typical features are more pronounced, while others, such as the joint pains and the sweats, may never even appear. MacCallum reviews in detail the clinical history of the disease and discusses the joint lesions, the heart and blood vessel involvement, and specific and peculiar lesions. As to the cause of the disease, MacCallum says: "It seems certain that rheumatism is caused by a specific infectious agent of some peculiar kind, not recognizable by our present methods of study and not as yet found to be transferable to laboratory animals. The constancy and peculiarity of the characteristic lesion makes it seem very improbable that any of the numerous forms of bacteria that have been isolated from such cases can have a true etiologic relation to the disease."

Romance of Medicine: William D. Haggard, Nashville, Tenn. (J.A.M.A., May 30, 1925), reviews the progress made in medicine in the last fifty years. He says that medicine is the only profession that is literally and altruistically devoted to professional suicide. It endeavors chiefly, not alone to cure, but to prevent disease, and thus to banish from mankind—pain, suffering and ultimate death from maladies of the flesh. But what it cannot prevent it must cure. What it cannot cure it must palliate. The discovery of the germ of tuberculosis, "the Captain of the men of Death," was the beginning of the annihilation of the Great White Plague and is a more important victory for mankind than resulted from the Fifteen Decisive Battles of the World. That the spirochete was the actual cause of syphilis, the great Black Plague, was discovered by Schaudin in 1905. A romance in medicine to grip the admiration of the world is the subjugation of typhoid fever. Most dramatic among modern victories is the conquest of yellow fever. In the last decade, many diseases of the heart, kidneys, gallbladder and other organs have been shown to be derived frequently from the foci of infection around the teeth, in the tonsils, in the sinuses of the nose, and in other structures. This great discovery has enabled the physicians to administer in many cases the most effective of all treatments, the removal of the cause. The discovery of radium by Madame Curie close on the discovery of the roentgen ray by Roentgen in 1896 was not only a triumph in wresting another secret from the physical world, but has furnished a most necromantic weapon for the cure of certain forms of cancer and for its palliation in hopelessly neglected cases. The use of safe drugs for local injection in rendering surgical operations painless is now like a performance in a world of magic. Antitetanic serum to prevent lockjaw is the king of preventive serums. Physicians and the whole world are daily debtors to the innumerable instruments of precision, to the blood pressure apparatus, the basal metabolism rate machines, and the newer instruments for administering gases, that render anesthesia almost totally devoid of danger. What is more astounding than the revelation in the last few decades of the part played in our bodies and lives by the wonder-working ductless glands? The greatest romance of the last few years in medicine was the discovery of insulin by Banting. The solution of the pellagra problem seems nearer with the increasing belief that pellagra is a deficiency disease, possibly from a shortage of vitamins, and seems to be caused by faulty protein food mixture and is generally benefited by fresh meat and milk. The most threatening cloud of chronic disease in the South, hookworm, has been dissolved by the wand of Aesculapius. The real romance of present day medicine is to pre-

vent or to discover early the degenerative conditions of the great organs, the heart, kidneys, liver and brain. All the saving in life has been in the prevention of infant mortality in the control of contagious diseases. Eternal vigilance of every individual by his physician is the price of lengthened life in the middle age. Community health is much in advance of the prevention of illness in the individual. *Have a thorough physical examination on your birthday!* It should be a real survey of a man's physical as well as mental status. It is estimated that the number of cases of sickness in this country in a year is thirteen and a half million, costing the nation a billion dollars. It is astounding to think that there are 225 million days of sickness a year in the United States. If it were possible, by a nation-wide effort, to reduce the amount of sickness by 25 per cent, the total economic gain yearly would be around a quarter of a billion dollars. The people should be taught that in truth there can no more be different "schools" of medicine than there can be different schools of physics, or of mathematics or astronomy. There is nothing under the sun which is of proved value that has not and will not be used by the profession in the treatment of disease. All non-medical agencies are enthusiastic endorsers of health examinations. A health week should be established nationally by all the health agencies of this country, with the cooperation of every one of the 90,000 members of the American Medical Association. The press can be counted on to do its part, which is an essential as it is unfalteringly interested and helpful in all health movements. A manual for the examination is being prepared by the American Medical Association. Examination blanks can be obtained from the headquarters, making for completeness and uniformity. The stupendous advance in medical education in the last fifteen years reads like a romance. The supply of an adequate number of sane, resourceful, dependable physicians should have the solicitude of the profession as a whole, as well as of the medical educators. The laboratory side also should not be overcultivated. Fundamentals should be stressed, but recondite experimental work omitted in the undergraduate course. In this desirable correlation between the pure sciences and the clinical subjects, the student of anatomy and pathology should be brought in his first two years into contact with the patient, so that he will appreciate the relationship of his studies to the problems of disease. Regarding clinical work in England, the Council on Medical Curriculum has advocated the continuation in the clinic itself of anatomy, physiology, pathology and chemistry, as these apply to the problems of medicine and surgery there presented. The question of entering the student into practice at an earlier age is important. It is impossible to devote to preliminary preparation less than two years of college work in biology, physics and chemistry, and it is impossible to eliminate anything from the four year medical course. The hospital year is essential. The only chance to curtail the length of time would be by saving one or two years in the high school. This can be done by the four quarter school year and no compulsory vacation at an unchangeable time, thus saving one or two years for the student with medicine as his goal. One of the greatest romances in the art of medicine has been the amazing growth and perfection of the specialties. One of the drawbacks of specialization is that it loses for the physician the personal touch and close contact with the family and with the acutely ill. The general practitioner must retake his former position of importance.

Care of Toothbrushes: In order to keep their toothbrushes in a condition in which they will be efficient tooth-cleansing appliances, patients should be told that they must observe the following rules: 1. Always purchase brushes marked hard. Medium and soft brushes become practically useless in a few days. 2. Always have two brushes in commission at one time, and use one for mornings only, and the other for evenings only. Thus each brush will have a drying period of twenty-four hours, and its bristles can become thoroughly dry and hard before using again. One brush should be marked "N" with a penknife. A brush which is used before retiring at night will never be found to be dry in the morning, when it would, in the usual course of events, be used again. Night air is usually moist, so that the day air is needed to allow the bristles to dry. 3. Always buy a new brush every two weeks at the most. Thus a brush is never kept more than a month. The new brush should always be

used for the evening cleaning of the teeth, which become covered with food film from the three or four daily meals. The brush which has been used for this evening cleaning is now transferred to the morning cleaning, and a stroke can be added to the "N" to make it into an "M."—Cecil Pincus, in *Australian J. Dentistry*, April 1, 1925.

Causal Factors in Infant Mortality: This is the title of a statistical study based on investigations in eight cities, by Robert Morse Woodbury, Ph.D., Director of Statistical Research, United States Children's Bureau, summarizing, the detailed studies of infant mortality made by the Bureau in eight cities: Johnstown, Pa.; Manchester, N. H.; Brockton, Mass.; Saginaw, Mich.; New Bedford, Mass.; Waterbury, Conn.; Akron, Ohio; and Baltimore, Md. The large number of infants (23,000) for which material is available in this consolidated report permits an extended analysis of some of the more important factors in infant mortality and affords a basis for conclusions as to causes not considered in the reports on individual cities because of the smaller numbers. Some of the facts indicated by Dr. Woodbury's analysis of causal factors of death among the babies studied are as follows:

(1) Causes related to prenatal and natal conditions were first in importance and responsible for nearly one-third of the deaths under one year, the rate from these causes being 36.1.

(2) The mortality decreased month by month during the first year of life, dropping from 44.8 in the first to 9.3 in the second, and to 4.5 in the twelfth month.

(3) Seasonal conditions influenced the rate—for instance, August showed the maximum mortality from gastric and intestinal diseases and January the minimum. Mortality was lowest for infants born in August and highest for those born in June.

(4) Mortality for male babies was about one-fourth higher than for female, a fact apparently explainable only by differences in vitality.

(5) First-born children had a slightly higher mortality than second-born. Leaving the first-born out of account, the mortality rate tended to increase with the order of birth; the increase, however, was associated primarily with increasing economic pressure.

(6) The mortality rate was highest for infants born within a short interval after preceding births, and lowest when a four-year or longer interval occurred between births.

(7) Mortality among the exclusively artificially fed babies averaged between three and four times that among the exclusively breast-fed.

(8) Infant mortality rates classified according to color and nationality of the mothers showed the lowest rates for Jewish babies, and in ascending order, higher rates for native white, German, Italian, colored, Polish, French-Canadian and Portuguese the rates ranging from 53.5 to 200.3.

(9) Housing congestion, employment of the mother away from home, and low earnings on the part of the father were important factors, tending to increase infant mortality.

Facial Palsy Following Scarlet Fever: Two cases of unilateral peripheral facial palsy are reported by P. N. Mutschmann, Calumet, Iowa (J.A.M.A., May 30, 1925). Both cases followed attacks of scarlet fever, with apparently only a moderate degree of glandular involvement, and both, after several months of apparently complete clinical recovery, have developed an intermittent paralysis of the seventh nerve on the right side.

New Vitamin: Experiments with the diet of white rats disclosed that on a certain diet they will thrive but will not produce young or, if they have young, will not have sufficient milk to feed them, will become nervous, irritable, cross with the young and even eat them. Olive, peanut, soy bean and peach kernel-oil were found to restore and promote fertility but failed to produce lactation (that is, milk for the young). The seeds of wheat, corn, hemp produced fertility and lactation. From these facts are inferred the existence of a new vitamin, called Vitamin E or Vitamin X.—Barnett Sure, of the University of Arkansas.

Dental Education in the United States: We have received a copy of the Minutes and Proceedings of the Dental Faculties Association of American Universities from its commencement in 1908 to 1924. This body is now merged in the American Association of Dental Schools. As far back as 1884, various dental schools in the United States organized a body called the

National Association of Dental Faculties for the purpose of standardizing and regulating dental education. At that time, and for many years afterwards, there were many private schools conducted for profit and not affiliated with any university. The teaching was often on a very narrow basis and consisted largely of a mechanical training. The university dental schools began to increase in number and in 1908 the Dental Faculties Association of American Universities was formed, membership of which was limited to those dental schools in connection with a university. The Association met annually and performed a most valuable service to dental education in America. Gradually, the private schools with their inferior standard of education dropped out, until in 1921, two-thirds of the dental schools were parts of state or endowed universities. The task of the Association must have been an uphill one judging from the reports of the proceedings, but their struggle to increase the course of study and to obtain a satisfactory standard of preliminary education has been successful. The proceedings were private, but in 1924 it was decided to publish them from the commencement. The present pamphlet is the result, and is most instructive reading. We notice throughout in each annual report a steady insistence on the necessity of a good general education as a preliminary to dental education. Of the wisdom of this, there can be no doubt. The chief fact which emerges from the experience of all dental teachers is that a sound education is absolutely necessary before a student can profit from instruction in dental subjects. We cannot but regret that there is no comparable body in this country. At present, there is no way in which the dental teachers in the various dental schools in this country can meet and discuss dental education. The dental journals and societies are not an equivalent substitute as a medium of discussion, for the majority of their readers and members are not engaged in teaching. An association of dental teachers which might meet annually and discuss various aspects of dental education could not fail to be of use. It would afford an opportunity to teachers from various schools to discuss their methods and gain from each other's experience. We believe that such a body properly organized would react favorably on the standard of dental education in this country, and prove of great service.—Brit. Dent. J., April 15, 1925.

Infection and Disease: Only a very few old persons have fully preserved teeth; in fact, most of them have lost their teeth and have worn plates since the fifth decade of life. A dead nerve in a tooth will prevent appreciable local reaction, and although possibly enabling its possessor to eat better for a time, he is conducting his health on borrowed capital, as he may not have a physician or a dentist who will appreciate that the sickness or broken health which may develop is due to such an apparently trivial cause. We ask much of the x-ray in the investigation of teeth and jaws. The infecting substance may present a shadow so small that even in a tooth known to be infected it does not show, or it may be lost in the range of the shadow of the tooth itself. By those who understand the reading of plates much may be ascertained from Nature's handling of calcium in comparing bone conditions of the two sides of the jaws, and with other infected teeth; the condensing or rarefaction indicates Nature's type of defence against infection by walling off an infected area or increasing its blood supply after the removal of the calcium. Comparatively few physicians understand the reading of such plates. The condition of the teeth then means much to the one who is searching for the focus of infection and type of tissue reaction, also to persons now comparatively well who may in the future develop a variety of diseases which destroy health and happiness, if not life. Because the secondary lesion is not recognized, the dangers of focal infection are discredited until too late in cardiac, renal and vascular diseases.—Charles H. Mayo, in Illinois M. J., April, 1925.

Facial Casts: An improved method of obtaining the dental insert in the facial cast is described by Herbert L. Margolis (Internat. J. Orthodontia, April, 1925). This method was devised when the author found, in following a textbook technic, that because of involuntary movement, the tip of the nose and that of the chin could not be regarded as fixed points. Thereafter, a line along the forehead and the osseous part of the bridge of the nose were used as fixed points. The method is declared to have the following advantages: 1. It causes

less inconvenience to the patient because a smaller part of the face is covered and breathing is not made more difficult, as no tubes in the nose are necessary. 2. It is more accurate because the tip of the nose and the tip of the chin are not used as points of relation since they have been shown to be movable. 3. The laboratory technic is simpler because when the model of the insert is separated from its impression, it entails less work than when a larger section of the face is covered.

The Dental Hygienist: A new teacher is growing up in our midst, of the feminine persuasion like most teachers, young and full of enthusiasm. She is the apostle of prevention in dentistry—real prevention. Her glory is not to slay; her duty is to save. For her no gory field of battle among slaughtered molars and bicuspids; her ministrations are not accompanied by the wails which attend the filling of tortured incisors. Her weapons are not probes but orange wood sticks. Instead of the devilish whirr of the burr we hear her kind voice extolling the advantages of a balanced diet for the prevention of decay. And the children rise up and call her blessed and are glad to see her again. On the one hand, the weary round of patching up and patching up again; on the other the slow but sure results of education and prevention. Which is the best bet for the municipality?—*Commonwealth* (Mass.).

Value of Indexing of Literature: The indexing of our literature has been a part of his (Dr. Bebb's) work and the value is best illustrated in a discussion we had over a recent report of one of our research workers who did a piece of work and after completion is was found that the work had already been done in Germany and Sweden in a more thorough manner. If investigators before starting on a given piece of work would first scan the dental literature of the world they would be working on a more economical basis and would not only save their own time and the money provided for such work, but could make better progress by taking up the work where the last known world investigators had left off. Now, this is possible only by indexing our literature and having a library such as Dr. Bebb's, who can place his hands on that which has already been gone over thoroughly.—Oral Hygiene, April, 1925.

Ultraviolet Rays and Rickets: In a consideration of the essential importance of the ultraviolet rays of the sun in medicine, Alfred Hess (*J.A.M.A.*, April 4, 1925) reaches the following conclusions: Rickets affords an excellent criterion for the investigation of the biologic activity of the sun's rays, for we know within narrow limits the band of ultraviolet radiations that is effective in preventing or curing this disorder. A comparison of the yearly amount of actual sunshine in cities in the temperate zone demonstrates that there is no close parallelism between the incidence of rickets and annual sunshine. It shows, furthermore, that the occurrence of rickets does not depend on an equable distribution of sunshine throughout the year. In the Panama Canal Zone, where rickets is practically nonexistent, not only is the yearly sunshine less than in New York but it is less evenly distributed; and there are fewer hours of sunshine during the rainy season in Colon or Ancon than during the corresponding winter period in New York. The determining factor is the quality, not the quantity, of the sun's rays—the amount and intensity of those ultraviolet radiations which alone are of value in preventing rickets. The results of heliotherapy during the winter months have been disappointing owing to the fact that the "antirachitic region of the solar spectrum" is very limited at this season and that the infants cannot be exposed directly to the rays on account of the severity of the climate. It would seem that the amount of the effective solar radiations is so small in the winter that even if we substitute quartz panes for ordinary window glass, it will be insufficient to afford protection and eradicate rickets. The most promising prophylactic measures are ultraviolet light from artificial sources or the use of cod liver oil, or potent extracts of this oil. Possibly foods that have been activated by irradiation will prove to be of value in this connection; for example, dried milk that has been rendered antirachitic by this means. Something also may be accomplished in this direction by improving the hygienic condition of the milch cows. At present many of those furnishing the best grade of milk are kept throughout the year in sunless barns, are allowed a very limited amount of exercise, and receive little or no fresh green fodder.

Physical Education: Dr. Tait McKenzie summarized an address on "Physical Education," as follows: 1.—Exercise must always be appropriate to the age and sex of the children, as determined by the laws of growth. 2.—Artificial conditions of child life must be met by a campaign of education that will be continuous and coherent, and in the hands of those that have learned their profession and who are adequately fitted for their work. 3.—Certain schools, colleges and universities must include courses of instruction in physical education for teachers that will enable them to take a place of equal dignity with the others of any teaching staff or school faculty. 4.—And finally, I would consider the advisability of a central examining board to decide on the subjects to be taught in this course, to examine all teachers and to give them a diploma or certificate, recognized by all educational bodies in Great Britain.—Toronto Health Bull.

The Discovery of Vitamins: The discovery of vitamins dates to the middle of the 18th century. In 1747, James Lind, a surgeon in the British Navy, carried out a series of experimental observations upon sailors suffering from scurvy, the conception and performance of which were entirely admirable. By appropriate control experiments, he showed that the medical means in vogue for the treatment of the disease were futile, when not harmful, but that orange and lemon juices were a specific cure. Lind attempted to ascertain the relative antiscorbutic value of various fruits and green vegetables, but was unable to observe a "superior virtue" in one rather than in another. He confirmed Kramer's observations made at the beginning of the 18th century, during the war between the Turks and the Holy Roman Empire, that dried vegetables were useless, and adopts the explanation of his friend Cockburn "that no moisture whatever could restore the natural juices of the plant lost by evaporation," which Cockburn imagined were "altered by a fermentation which they underwent in drying." Lind was struck with the beneficial effect of cow's milk in the treatment of scurvy. He explained it on the supposition of the milk "being a truly vegetable liquor, an emulsion prepared of the most succulent wholesome herbs." Lind applied himself to the applications of these discoveries for the prevention of scurvy in the Navy, and recommended lemon juice concentrated to a syrup by evaporation to be carried in all ships and served to the sailors. By the beginning of the 19th century, the carriage of lemon juice was made compulsory, first in the Navy and subsequently in the mercantile marine, with the result that the ravages of scurvy were prevented. With the advent of steam traction, too, the length of voyages was curtailed and supplies of fresh provisions were obtained at more frequent intervals. Scurvy became rare, and the medical profession, being no longer faced with this disease of dietary deficiency, soon forgot the significance of Lind's discoveries. Before leaving this subject, a curious fact may be related. The lemon juice supplied to the Navy was at first made from lemons grown in Spain and the Mediterranean countries. Afterwards, when England took over the West Indies, it was made from the lime, and scurvy again broke out. The reason of this is now known to be that, whereas the lemon is particularly rich in antiscorbutic vitamin, the lime is correspondingly poor.—David Bruce, in Oral Health, April, 1925.

Preventive Dentistry: It is said of the American Army in the last war that it was the hardiest army that ever trod the earth. I believe that it is admitted that this was due in no inconsiderable part to the efficiency of their dental preparation and care. It was said of the 77th Division that from a dental standpoint it was the best group of men that was ever known. The reason for this was the work done for them in preventive dentistry. This is what we should seek—the prevention of oral sepsis. We are continually being told in France that a chief reason why we did not get those terrible conditions following bad injuries to the jaws so commonly as did our Allies was because of the splendid treatment the men had received for their mouths before getting the injuries.

The best thing of all is that we have learned to work together, but I still think the dentist should not allow himself to be pushed off the map as to what should be done in the mouth. Let the physician tell you what may be done in regard to the general health, but let the dentist hold fast

to his own judgment as to what should be done in the treatment of the mouth, and especially in the treatment of oral sepsis.—Harlow Brooks, in Oral Topics.

The Care of Children's Teeth: From the day baby is born a mother should wash its gums, the roof of the mouth, the inside of the cheeks with cotton dipped in boric acid. As soon as the teeth appear the use of a toothbrush should begin. Not merely morning use, but a cleansing after each and every feed. A very small single-row toothbrush may be used, dipped in a normal salt solution. A normal salt solution is prepared by dissolving one-half teaspoonful of salt in one glass of cool boiled water. When the child is old enough to understand, have him rinse his mouth as well as brush the teeth—until every particle of food has been removed. The child should be brought to a dentist as soon as all the baby teeth have come in, or earlier if dark spots appear on any of them, and at least every three months thereafter, for timely correction of decay. For decay in a baby tooth progresses very rapidly and should be attended to as quickly as possible. Timely and frequent visits to the dentist when the child is young, serve a manifold purpose, doing away with the fear of the dentist and a dental office, and instead of associating such visits with pain and horror, the child comes to consider the dentist as a friend who keeps his teeth beautifully clean. Systematic early treatment also preserves the baby teeth and prevents inflamed pulps or nerves. For you must know that the baby teeth have nerves as well as the second teeth, also you should know that unless the baby teeth are properly taken care of, the child's growth and development are retarded—it cannot get the full nourishment out of its food, no matter what and how much it eats.

The little cost of preventive dental attention when a child is young will save you and the child many dollars in later years.

Prevention of abscesses, prevention of irregularities or crooked teeth—these are but two of the many advantages of early and regular dental inspection.—Lena Stillpass, in Dent. Outlook, March, 1925.

Osteomalacia—A Deficiency Disease: The idea that osteomalacia is due to a metabolic disturbance analogous to that of rickets is not a new one. Several years ago, Funk wrote that late rickets forms the natural stepping stone between rickets in small children and osteomalacia. Because the latter disease was formerly observed with greater frequency in pregnant women, a direct connection between pregnancy and osteomalacia was assumed by some writers. However, the assumption cannot be sustained in the light of the more widespread occurrence of osteomalacia following the beginning of the World War and not confined to any sex or age. This prevalence of the disease in central Europe was coincident with a lack of certain types of foods. Osteomalacia is very prevalent throughout the northern and western parts of China. This has furnished an opportunity to study the blood of persons in regions where the malady is, so to speak, endemic. Miles and Feng of Peking have observed decreases in the calcium and sometimes the phosphorus content of the serum, the variations depending on the severity of the disease and its duration. The blood findings were frequently like those of rickets with tetany. Hyper-excitability of the muscles is almost universal among such patients. Some of them show a negative calcium balance suggesting either a deficiency of the element in the diet or the lack of some factor that serves to make retention more satisfactory. An improvement in the diet, which is usually very poor among those affected, tends to bring relief. Hence Miles and Feng believe that osteomalacia should now be classed as a deficiency disease of the same category as that including rickets or, more generally, the disturbances in metabolism in which lime salts cease to be deposited properly in the bones and cartilage. The deficiency is conceived at present to involve principally the content of fat-soluble vitamins, although there may be a calcium deficiency at the same time.—J.A.M.A.

Care of Teeth During Pregnancy: Summary: That the teeth are a source of infection in certain kidney lesions is recognized. The function of the kidneys must be safeguarded during pregnancy. Teeth showing evidence of periapical infection may be safely removed during pregnancy. Cooperation of the dental surgeon in diagnosis and treatment is a necessity. Preparation of the patient is essential. Selection of the teeth to be removed is of importance. Removal of the areas of infection should be by steps.

Surgical removal is the method of choice in most cases. Local anesthesia is satisfactory in practically every case. The period of pregnancy at which removal may be best accomplished depends upon the condition of the patient. Early removal of the dental foci should be a part of every prenatal régime. Prophylactic periodontia is equally important. Carious teeth demand attention. Temporary dental fillings are more advisable than permanent work.—R. N. Rowley, in Surg., Gynec. & Obstet.

Preventive Measures With Children: The present time is very favorable to the dental profession, in that the public, as parents and also as individuals, are awakening to the importance of treatment, and have given us improved conditions under which to work, and seem more willing to consider that the efficient dental surgeon is worthy of adequate remuneration. Moreover, the members of the medical profession as a whole are more alive to the importance of oral hygiene, and are sending their patients for treatment earlier, and also one finds the M. O.'s of towns and institutions cooperating very well with their dental colleagues. In this connection one is compelled to notice that some medical men are attributing all sorts of evils to certain kinds of dental treatment, and make no allowances for the undoubted advances made in dental science during the last decade in particular. This is no doubt a passing phase. Unfortunately the dentist has his work more easily attacked, insomuch as his conservative work at any rate is easier to get at and put blame upon than are errors in diagnosis, etc., on the part of a medical man. Further, it is an easier matter to find a supposed cause in the mouth than elsewhere in the body. Happily, however, modern methods of examination, radiographic and otherwise, enable one to more justly point to the true cause, and to accept blame only when it is one's due.—W. Bowler, in Dent. Rec., March, 1925.

Rheumatism: In younger persons many cases are characterized by "skipping" pains from joint to joint, with swelling of the joint. Any joint, including those of the spinal column, may be involved. This group is notably caused by germs or infectious agents although as yet no specific germ has been found. This type of case frequently is associated with infected areas somewhere in the body like tonsils, appendix, gallbladder or other organs, and this is the kind of arthritis which may be cured by removal of the infected area. The infected area is called a "focus of infection," and it may be situated almost any place in the body. Not by any means are teeth and tonsils the sole possible foci of infection. Nor is it true that in every case the removal of an infected area results in cure, but it is true that in a very large number of cases the results are brilliant, provided great care is used to find a real focus. Rheumatic joints are found in some definite diseases, like tuberculosis, gonorrhea, or syphilis; and of course the treatment in these cases is the treatment of the original disease. Gout is an arthritis with chalk deposits around the joints and often on the lobe of the ear. This is probably due to some disturbance of the chemistry of the body. Fortunately in America at the present time, it is a comparatively rare disease. There are still other kinds of arthritis—for instance that seen so frequently in elderly women who rather suddenly find that their knees give way when the walk. This is a chronic, slowly developing arthritis which may be present for years without producing any symptoms until excessive use of the knee joints causes an acute irritation. This type of arthritis usually yields fairly easily to proper treatment.—Solomon Strouse, in *Hygeia*, May, 1925.

AMERICAN DENTAL ASSOCIATION SIXTY-SEVENTH ANNUAL SESSION

LOUISVILLE, KENTUCKY, SEPTEMBER, 21, 22, 23, 24, 25, 1925

OFFICIAL CALL

To the Officers, Members and Constituent Societies of the American Dental Association:

You are hereby notified that the Sixty-Seventh Annual Session of the American Dental Association will be held at Louisville, Ky., Sept. 21-25, 1925.

The House of Delegates will convene at 10:00 o'clock in the forenoon and 2:30 o'clock in the afternoon, Monday, September 21, in the Lounge Room, Kosair Temple. The third and fourth meetings of the House of Delegates will be held Wednesday and Thursday, September 23 and 24, at 2:30 o'clock, in the Ball Room, Brown Hotel.

The general meeting, which constitutes the opening exercises of the Session, will be held Tuesday, September 22, at 9:40 a. m., in the Ball Room, Brown Hotel, and general meetings will be held at 8:00 p. m. on that and subsequent days of the Session.

The various sections of the American Dental Association will meet Tuesday, September 22, at 2:00 p. m., and thereafter, according to their respective programs.

The Registration Department will be open from 8:30 a. m. until 5:00 p. m., Monday, Tuesday, Wednesday and Thursday, September 21, 22, 23 and 24, and from 8:30 to 10:00 a. m., Friday, September 25, in the Main Lobby, East Entrance, Kosair Temple.

The constituent societies are hereby notified to file with the General Secretary of this Association, at least thirty (30) days prior to the first day of said Annual Session, a list of the names and addresses of their delegates and alternates.

C. N. JOHNSON, *President.*
OTTO U. KING, *General Secretary.*

MEMBERS OF THE HOUSE OF DELEGATES, 1925*

DELEGATES AND ALTERNATES

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Delegates

C. F. Chandler, Montgomery
George S. Vann, Gadsden

Alternates

R. A. Rush, Mobile
J. A. Blue, Empire Bldg., Birmingham

ARKANSAS

Delegates

I. M. Sternberg, 302-303 Merchants Nat'l Bank Bldg., Fort Smith

J. D. Jordan, 510 Boyle Bldg., Little Rock

Alternates

E. H. Johnson, 205 Citizens Bank Bldg., Pine Bluff

H. J. Crume, Wilson Bldg., El Dorado

ARMY DENTAL CORPS

Delegate

Colonel Robert T. Oliver, D.C., Army Bldg., 39 Whitehall St., New York, N. Y.

Alternate

Major Don G. Moore, D.C., Fort Benning, Georgia

*This list will be revised, Aug. 23, 1925, in accordance with the ruling as presented in the Constitutional By-Laws, under "Qualifications, Terms and Registration of Delegates and Alternates": Sec. 3.—The number of delegates to which each constituent society may be entitled shall be based on the number of members from whom dues for the current year shall have been received by the general secretary of this Association at least thirty days prior to the first day of the annual Session of this Association. . . . Sec. 6—Previous to the annual Session the general secretary of this Association shall prepare and have printed a list of the delegates and alternates, elected by the various constituent societies; also the number of paid members of each.

CALIFORNIA

Delegates

Hugh Avary, 209 Post St., San Francisco

James Allen Graham, 209 Post St., San Francisco

B. Frank Gray, 209 Post St., San Francisco

Arthur R. McDowell, 4118—18th St., San Francisco

Guy S. Millberry, First and Parnassus Ave., San Francisco

Alternates

J. Franklin Moore, First Nat'l Bldg., Oakland

COLORADO

Delegates

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E. R. Warner, 412 Metropolitan Bldg., Denver

C. S. Kramer, Woodmen

Alternates

George R. Warner, 610 California Bldg., Denver

J. W. Needles, 610 Thatcher Bldg., Pueblo

Isaac Burton, 204 Hagerman Bldg., Colorado Springs

CONNECTICUT

Delegates

A. A. McLaughlin, 1115 Main St., Bridgeport

S. E. Armstrong, 185 Church St., New Haven

E. S. Arnold, 171 Washington St., Hartford

Morton J. Loeb, 66 Trumbull St., New Haven

Alternates

Alfred C. Fones, 10 Washington Ave., Bridgeport

C. G. Brooks, 302 State St., New London

E. Frank Cory, 62 Trumbull St., New Haven

Ira D. Beebe, 886 Main St., Bridgeport

DELAWARE

Delegate

Charles R. Jefferis, Jr., 1204 Jefferson St., Wilmington

Alternate

Clyde A. Nelson, Milford

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Allen S. Wolfe, 1710 R. I. Ave. N.W., Washington

Alternates

A. J. Brown, 1819 Vernon St. N.W., Washington

C. W. Camalier, 1029 Vermont Ave., Washington

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Delegates

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H. C. Farrin, St. Augustine

Alternates

Jesse L. Williams, 332 St. James Bldg., Jacksonville

E. H. Clarkson, 604 Professional Bldg., Jacksonville.

GEORGIA

Delegates

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DeLos L. Hill, 12 W. 11th St., Atlanta

Alternates

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H. H. Williamson, Albany

F. C. Wilson, Savannah

IDAHO

Delegate

M. Y. Lucas, McCarty Bldg., Boise

Alternate

C. A. Philpott, Overland Bldg., Boise

ILLINOIS

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C. N. Johnson, 22 E. Washington St., Chicago

Don M. Gallie, Sr., 25 E. Washington St., Chicago

Truman W. Brophy, 81 E. Madison St., Chicago

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A. D. Black, 122 South Michigan Ave., Chicago

M. M. Printz, 25 E. Washington St., Chicago

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F. B. Moorehead, 30 N. Michigan Ave., Chicago

F. B. Noyes, 30 No. Michigan Ave., Chicago

R. R. Blanchard, 508 First National Bank Bldg., Springfield

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J. H. Cadmus, 25 E. Washington St., Chicago

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E. Ethel Taggart, 312 Second Nat'l Bank Bldg., Freeport

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P. H. Chadwick, Rushville
W. E. Neuenschwander, 401 Medical Arts Bldg., Ft. Wayne
F. R. Henshaw, 904 Medical Arts Bldg., Indianapolis
H. C. McKittrick, 1006 I.O.O.F. Bldg., Indianapolis

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L. E. Van Osdol, Peru
W. R. Meeker, Peru
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A. B. Price, 14-15 Colonial Bldg., Richmond
R. H. Williams, Bedford
F. Wade LaRue, 508 Pythian Bldg., Indianapolis

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C. H. Henshaw, 1112 Bankers Trust Bldg., Des Moines

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G. A. Crise, Manhattan
G. E. Burket, Kingman

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E. E. Carpenter, 625 Kansas Ave., Topeka
Lester D. Mitchell, Arkansas City
E. C. Glass, Independence

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J. F. Wright, Russell
H. B. Tileston, Sr., 916 Starks Bldg., Louisville

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Frank B. Hower, 814 Francis Bldg., Louisville
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Thomas H. Posey, Lawrenceburg

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Malcolm E. Kaffie, 307 Hutchinson Bldg., Shreveport

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Leon W. Peart, 507 Guaranty Bank Bldg., Alexandria

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W. P. Martin, Hagerstown

Alternates

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Richard H. Norton, Jr., 45 Bay State Rd., Boston

Alternates

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Percy R. Howe, 199 Marlboro St., Boston
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B. W. Palmer, 232 University Ave., Rochester
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D. A. Sniffen, White Plains

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Alternates

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T. E. Barber, Grand Forks

Alternates

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Homer C. Brown, 609 Hartman Bldg., Columbus
F. M. Casto, 1334 Keith's Theater Bldg., Cleveland
E. C. Mills, 255 E. Broad St., Columbus

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J. V. Gentilly, 764 Rose Bldg., Cleveland
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P. J. Aufderheide, 9107 Miles Ave., Cleveland
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A. B. Walker, Security Nat'l Bank, Norman

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Clyde Mount, Oregon City

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A. C. Young, 121 University Place, Pittsburgh
F. D. Miller, Altoona
Leslie Waddill, Jenkins Arcade, Pittsburgh
B. P. Rial, 4506 Fifth Ave., Pittsburgh

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E. R. Sausser, 235 S. 15th St., Philadelphia
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Robert Zugsmith, Jenkins Arcade, Pittsburgh
W. J. McKinley, N. E. Cor. 17th & Spruce Sts., Philadelphia
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D. S. Gardner, Dime Bank Bldg., Scranton
C. W. Hagan, 321 Wood St., Pittsburgh
G. H. Smock, 1208 Palace Bldg., Erie

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Bert Boyd, 1010 Story Bldg., Los Angeles
J. W. Neblett, Hoyt Bldg., Riverside
J. W. Gray, 910 Union Bk. Bldg., Los Angeles
G. E. O'Neil, 630 First Nat'l Bank Bldg., Long Beach

Alternates

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John P. Buckley, 1550 N. Hayworth Ave., Los Angeles
Kent Kerch, Timpken Bldg., San Diego
C. M. Alderson, 306 Chapman Bldg., Los Angeles
Guy Van Buskirk, 906 Union Bank Bldg., Los Angeles

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Delegates

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H. M. Hucks, Georgetown

Alternates

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E. A. Earley, Darlington

SOUTH DAKOTA

Delegates

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W. W. Price, Centerville

Alternates

J. L. Martin, Vermillion
H. F. Stevens, Aberdeen

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F. W. Meacham, 911 Hamilton Nat'l Bank Bldg., Chattanooga
H. A. Holder, Lambuth Bldg., Nashville

Alternates

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J. G. McDowell, 701 Hitchcock Bldg., Nashville
Justin D. Towner, 1206 Exchange Bldg., Memphis
W. B. Clotworthy, Medical Bldg., Knoxville

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George H. Mengel, 314 Roberts-Banner Bldg., El Paso
B. F. Thielen, Paris

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W. P. Delafield, 406 Medical Arts Bldg., Dallas
F. M. Hight, 1031 Bankers Mortgage Bldg., Houston
C. D. Wofford, Plainview
W. R. Weber, 506 Littlefield Bldg., Austin

VERMONT

Delegate

Charles H. Cole, Vergennes

Alternate

VIRGINIA

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M. B. Rudd, 502 Methodist Publishing Bldg., Richmond
John Bell Williams, Professional Bldg., Richmond

Alternates

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R. H. Walker, 605 Taylor Bldg., Norfolk
F. W. McCluer, Lexington

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Aubrey L. Martin, Medical-Dental Bldg., Seattle

Alternates

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W. I. Ferrier, Medical-Dental Bldg., Seattle

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A. I. Marple, Huntington
C. H. Neill, Fairmont

Alternates

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L. L. Belcher, Welch
Fred J. Hess, Fairmont

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W. I. Macfarlane, Tomahawk
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J. J. Wright, 1220 Wells Bldg., Milwaukee

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E. A. Steinhaus, 419 First Wisconsin Nat'l Bank Bldg., Milwaukee

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C. W. Hall, 123 Grand Ave., Milwaukee, Wis.
J. F. Biddle, 517 Arch St., Pittsburgh, Pa.
William A. Giffen, 905 Stroh Bldg., Detroit, Mich.
Frank T. Taylor, 419 Boylston St., Boston, Mass.

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L. G. Noel, Nashville, Tenn., 1902-1903
M. F. Finley, Washington, D. C., 1905-1906
A. H. Peck, Chicago, Ill., 1906-1907
William Carr, New York, N. Y., 1907-1908
Edward S. Gaylord, New Haven, Conn., 1910-1911
A. R. Melendy, Knoxville, Tenn., 1911-1912
F. O. Hetrick, Ottawa, Kan., 1912-1913
Homer C. Brown, Columbus, Ohio, 1913-1914
Donald McKay Gallie, Chicago, Ill., 1914-1915
Thomas P. Hinman, Atlanta, Ga., 1915-1916
Lafayette L. Barber, Toledo, Ohio, 1916-1917
William H. G. Logan, Chicago, Ill., 1917-1918
C. Victor Vignes, New Orleans, La., 1918-1919
John V. Conzett, Dubuque, Iowa, 1919-1920
H. E. Friesell, Pittsburgh, Pa., 1920-1921
Thos. B. Hartzell, Minneapolis, Minn., 1921-1922
J. P. Buckley, Los Angeles, Calif., 1922-1923
William A. Giffen, Detroit, Mich., 1923-1924

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Academy of Periodontology, Louisville, Kentucky, September, 17-19, 1925.

American Dental Assistants' Association, September 21-25, 1925, Louisville, Kentucky.

American Dental Hygienists' Association, September 21-25, 1925, Louisville, Kentucky.

American Dental Association, September 21-25, 1925, Louisville, Kentucky.

American Medical Association, 1926, Dallas, Texas.

American Society of Oral Surgeons and Exodontists, September 18-19, 1925, Louisville, Kentucky.

Fédération Dentaire Internationale, August 2-6, 1925, Geneva, Switzerland.

National Association of Dental Examiners, Louisville, Kentucky, September 21-22, 1925.

Pacific Coast Dental Conference, June, 1926, Portland, Oregon.

Seventh International Dental Congress, August 23-28, 1926, Philadelphia, Pennsylvania.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

National Capital at Washington, D. C., first Tuesday of every month.

September (1925)

Kentucky, at Louisville (18-19).

October (1925)

Florida, at Orlando.

Maryland, at Salisbury (12-13).

New England, at Boston, Mass. (15-17).

Susquehanna, at Wilkes-Barre, Pa., (19-21).

December (1925)

Nevada, at Reno (5).

New York, First District (2-4).

Ohio, at Columbus (1-3).

February (1926)

Minnesota, at St. Paul (10-12).

April (1926)

New Jersey (14-17).

May (1926)

Maryland, at Baltimore (3-5).

FIRST DISTRICT DENTAL SOCIETY OF NEW YORK

The First District Dental Society of New York announces a three day meeting to be held, December 2-4, 1925. It is planned to make this an annual feature of the winter program of this society. The program will contain a carefully selected list of essays by dentists and physicians of national reputation, and clinics by leading exponents of the various specialties of dentistry. The watchword of the meeting will be better dentistry, and no effort will be spared to make this meeting definitely helpful to everyone who attends. All sessions will be held in the Hotel Pennsylvania. Exhibits will be featured and opportunities for their inspection will be provided.

ALFRED WALKER, *Chairman*,
250 W. 57th St.,
New York City.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA

The Susquehanna Dental Association will hold its annual meeting in St. Stephen's Parish House, Wilkes-Barre, Pa., Oct. 19-21, 1925. A study course will be given, with no exhibits.

FULLER L. DAVENPORT, *Chairman*,
Executive Committee,
524 Miners Bank Bldg.,
Wilkes-Barre, Pa.

MARYLAND STATE DENTAL ASSOCIATION

The annual meeting of the Maryland State Dental Association will be held at Baltimore, May 3-5, 1926.

NORVAL H. MCDONALD, *Secretary*,
304 Morris Bldg.,
Baltimore, Md.

SEMIANNUAL MEETING OF THE MARYLAND STATE DENTAL ASSOCIATION

The semiannual meeting of the Maryland State Dental Association will be held at Salisbury, Oct. 12-13, 1925.

NORVAL H. MCDONALD, *Secretary*,
304 Morris Bldg.,
Baltimore, Md.

MONTREAL DENTAL CLUB

The first meeting of the Montreal Fall Clinic under the auspices of the Montreal Dental Club will be held in Montreal, Nov. 5-7, 1925.

A. L. WALSH, *Secretary*,
General Hospital,
Montreal, Canada.

INDEX OF PERIODICAL DENTAL LITERATURE

Compiled by
Arthur D. Black, A.M., M.D., D.D.S., Sc.D.

Another volume of this very interesting work has just been issued, covering a ten-year period, 1876 to 1885. It is the fourth volume thus far appearing, the first one covering the literature for 1911-1915, the second 1916-1920, and the third 1839-1875. It will thus be seen that all our periodical dental literature from 1839 to 1885 and from 1911 to 1920 has already been compiled for this stupendous work.

Never has anything appeared in our literature of greater importance than this, and those who have had occasion to use it are loud in their praise of its reliability and completeness. The profession is under deep obligation to Dr. Black for inaugurating this splendid idea, and for so faithfully and efficiently carrying it out to this point. Dr. Abram Hoffman, secretary-treasurer of the Index Bureau, is also to be highly commended for looking after the detail of publication, and for his efforts in promoting the financial backing. This work, when the remaining volumes are completed, will stand as a perpetual monument to the vision and energy of those responsible for its publication; and through its agency the literature of our profession will be placed on a more stable and satisfactory basis. The cost of each one of these volumes is $6.00—a trivial amount in consideration of the immense labor involved in bringing them out. They may be obtained by addressing Dr. Abram Hoffman, 381 Linwood Avenue, Buffalo, N. Y.

THE NEW DENTAL REGISTER AND DIRECTORY OF THE UNITED STATES AND CANADA

The thirteenth edition of "Polk's Dental Register and Directory of the United States and Canada" has been received in this office. Without exception, it is the best work of its kind ever published. It is well and attractively bound, and is printed on excellent paper, in clear type. The 1,300 pages carry much useful and timely information of a dental nature, brought down to date.

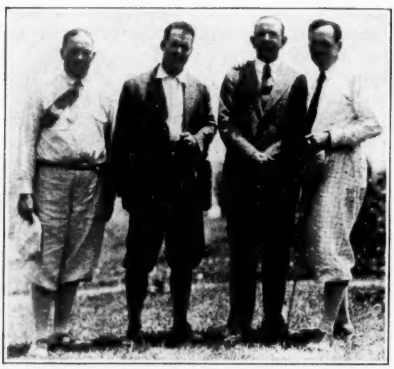
The work contains the names and addresses of more than 72,000 dentists. Taking into consideration the various items of information pertaining to each dentist, including indication of membership in the American Dental Association, the lists of societies, boards of dental examiners, dental laws, clinics, and a mass of informative material too extensive to enumerate, it contains more than 326,000 items of dental news matter. This, the first issue since 1917, contains 20,000 names not in previous editions, and much interesting material has

been included. A limited number of copies are on hand available for dentists who did not order the directory prior to publication.

The publishers, R. L. Polk & Co., 536 S. Clark Street, Chicago, and the editor, Dr. Louis Ottofy, are to be congratulated on the ability, energy and thoroughness indicated in the preparation of this volume.

CALIFORNIA GOLF TOURNAMENT

The golf tournament between the Northern and Southern California Dental Golf Clubs was held at Santa Barbara, May 14-17, 1925. In the ten man team match, May 14, Southern California was victorious by



Left to right: F. D. Schildwachter, winner of fourth flight; C. P. Dixon, winner of third flight; C. G. Hartley, winner of championship flight, and F. A. Giguette, winner of second flight.

a score of 7 to 2. The team from Southern California was composed of W. H. Spinks, L. K. Stewart, C. G. Hartley, L. D. Rankin, H. E. Cannon, C. R. Pierce, C. M. Benbrook, J. W. Hanley, R. A. Speicher, and F. S. Kaiser. Northern California had such mashie wielders as C. F. Jarvis, H. L. Brownell, J. D. Millikin, T. D. Heacock, W. H. Haskins, C. H. Whitley, C. P. Richards, Earl Clement, Dan Mulvihill and J. A. Eason. The annual dinner and selling of the Calcutta Pool was held in the evening, May 14.

Friday morning, May 15, the qualifying round for flights and Calcutta Pool was played. At 6 p. m., the Santa Barbara dentists gave a barbecue. Finals for all flights and defeated eights were finished, Sunday, May 17. C. G. Hartley of Los Angeles, won the championship flight and the dental golf championship for the second year. W. H. Haskins of San Francisco was runner-up. The second flight was won by F. A. Giguette of Pasadena, with M. G. Plank of Los Angeles runner-up. The third flight was won by C. P. Dixon of Los Angeles, with C. J. Zappettini of San Francisco runner-up. The fourth flight was won by F. D. Schildwachter of Los Angeles, with J. F. Crawford of Los Angeles runner-up.

In the defeated eights, the first flight was won by C. F. Jarvis of Oakland, second by A. L. Shellhorn of Los Angeles, third by F. Heimlich of San Francisco and fourth by F. K. Sylva of Honolulu.

Next year, the tournament will be held at Pebble Beach on Monterey Bay. We invite all dentists who are near us at that time to join in the festivities.

PSI OMEGA FRATERNITY

The annual meeting of the national alumni chapter of Psi Omega Fraternity will be held at the Kentucky Hotel, Louisville, Ky., Monday, September 21, 1925. An executive session will be held at 10 a. m. and general session and initiation at 2 p. m.

The annual banquet for members and ladies will be given at the Kentucky Hotel at 6:30 p. m. All members are requested to register at headquarters on arrival.

HAROLD S. SMITH, *Grand Master*,
1010 Belmont Ave.,
Chicago, Ill.

M. J. COUCH, *Secretary*,
3801 Broadway,
Chicago, Ill.

FEDERATION OF WOMEN DENTISTS

All women dentists attending the American Dental Association at Louisville should register early Monday morning, September 21. The program of the Federation of Women Dentists will then be available. The banquet, to be given Monday evening, affords the best opportunity for becoming acquainted. Last year, several missed this dinner because they did not hear of it in

time. This year the committee on publicity has endeavored to reach every woman dentist who reads THE JOURNAL.

M. EVANGELINE JORDON, *Chairman*,
1125 Marsh-Strong Bldg.,
Los Angeles, Calif.

NEW BOOKS RECEIVED FOR THE LIBRARY OF THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The Journal of the American Dental Association promptly acknowledges herewith the receipt of new publications. Books selected from those named on this list are reviewed below. Reviews are matter-of-fact statements of the nature and contents of the publication referred to and are intended *solely to guide possible purchasers.*

Life and Works of Guiseppancelo Fonzi. By Dr. Vincenzo Guerini, Dentist of the Surgical Clinic of the University of Naples; Doctor of Dental Surgery Ad Honorem of the Chicago College of Dental Surgery, etc. Philadelphia: Lea & Febiger, 1925. Pp. 136; illustrated; price $1.25.

Diagnosis by Transillumination. A Treatise on the Use of Transillumination in Diagnosis of Infected Conditions of the Dental Process and Various Air Sinuses, with a Chapter on the Electric Test for Pulp Vitality. Ed. 5. By W. J. Cameron, Ph.G., Chicago: Cameron's Publishing Co., 1925. Pp. 64; illustrated; price $2.00.

Anatomy of the Root Canals of the Teeth of the Permanent Dentition. By Walter Hess, M.D., D.D.S., Professor of Operative Dentistry in the Dental College of the University of Zürich. Anatomy of the Root Canals of the Teeth of the Deciduous Dentition and of the First Permanent Molars. By Dr. Med. Dent. Ernst Zürcher, School Dentist of Zürich. New York: William Wood & Co., 1925. Pp. 199; illustrated; price $5.50.

PATENTS OF INTEREST TO DENTISTS

1455673. Dental floss dispenser, Victor J. Shalek, Oak Park, Ill.

1455374. Dental lancet for treatment of pyorrhea, William Ziesel, Philadelphia, Pa.

62389. Des. Toothbrush and tumbler supporting fixture, John H. Balmer, Newark, N. J.

1456294. Tooth separator, George M. Arrowsmith, Kansas City, Mo.

1456279. Dental floss holder, Arthur L. Patterson, Albemarle, N. C.

1456535. Toothbrush, Myles H. Cartwright, Toledo, Ohio.

1456639. Flesh cutting shears, Celestin I. Lagier, Stockton, Calif.

1456717. Hypodermic syringe, A. E. Smith and A. D. Gray, Chicago, Ill.

1456526. Dental amalgam machine, Alfred G. Wright, Bywood, Pa.

1457824. Tooth holder, George R. De Nise, Rochester, Minn.

62447. Des. Toothbrush holder, Meyer Halpern, New York City, N. Y.

1457824. Centrifugal casting machine, Joseph D. Hammond, Jackson, Michigan.

1457370. Molding substance for dental and other uses and making same, Richard F. Jefferies, Richmond, Va.

1458062. Dentist's articulating paper, F. W. Keith, Belfast, Me.

1457385. Dental articulator, George S. Monson, St. Paul, Minn.

1458074. Toothbrush, Abraham Pikoos, Baltimore, Md.

1457867. Lingual bar, Reginald V. Williams, Buffalo, N. Y.

62479. Des. Combined toothbrush and paste holder, E. R. Erickson, Des Moines, Iowa.

1458293. Dental tool, Claude E. Hinchey, Weyauga, Wis.

1458835. Dental casting flask, Nathan O. Lynn, Tucson, Arizona.

1458782. Dental apparatus, Harry H. Shapiro, New York City, N. Y.

1458566. Toothbrush holder, Walter W. Welpley, Detroit, Michigan.

1458967. Attachment for dental articulators, Joseph Becker, West Hoboken, N. J.

Copies of above patents may be obtained for twenty-five cents each, by addressing John Saul, Solicitor of Patents, Federal Building, Washington, D. C.

If for any reason you have been unable to secure hotel reservations for the American Dental Association Meeting, September 21-25, write at once to Dr. Frank B. Hower, Chairman, Halls and Hotels Committee, 814 Francis Bldg., Louisville, Ky.

You Can Always Go to This One!

By Ernest V. Madison

MAY until October is the convention season—when professional men, tradesmen and manufacturers meet with others of their craft, interchange ideas and visit the exhibitors of products suited to their business use.

The convention habit is a good one. It combines cooperation and stimulation of mind into one pleasant vacational undertaking.

Go to the conventions—attend every one you can. You'll meet a bunch of the best fellows on earth and you'll get a wealth of good things from the sessions.

But supplement your attendance with regular visits to the "all year" convention that Uncle Sam brings to your door.

The "year round" convention for *the dentist* is THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.

Its editorial pages give stimulation and nourishment to your mind, through the presentation of subjects on and news of your field.

Its advertising pages exhibit new and improved products for your business use.

Start now. After attending the editorial or "convention" section of this issue, you can walk down the aisles of the advertising pages, looking at the manufacturers' exhibit there.